

PRINTED  
FIRST NAME \_\_\_\_\_PRINTED  
LAST NAME \_\_\_\_\_ASU ID or  
Posting ID \_\_\_\_\_Person on your **LEFT** (or **Aisle**)Person on your **RIGHT** (or **Aisle**)

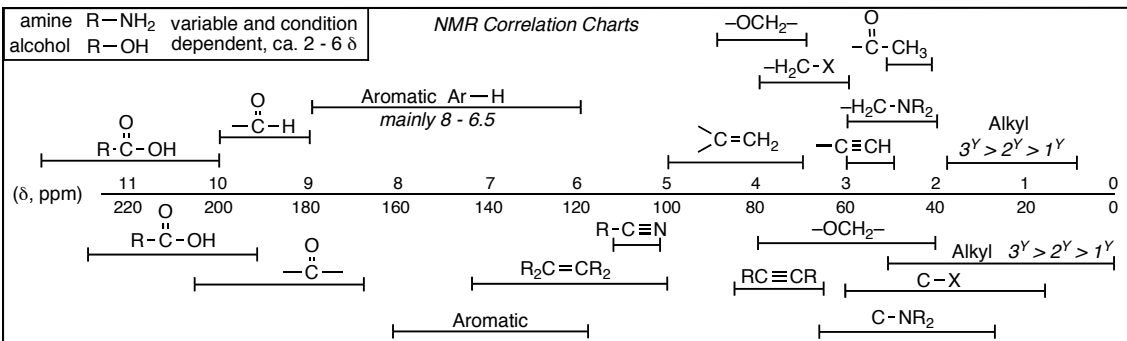
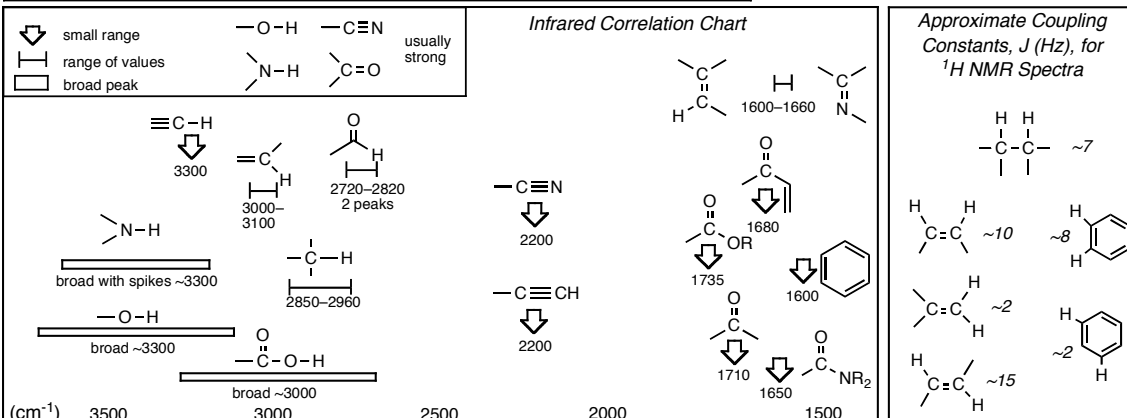
- **PRINT YOUR NAME ON EACH PAGE!**
- **READ THE DIRECTIONS CAREFULLY!**
- **USE BLANK PAGES AS SCRATCH PAPER**  
work on blank pages will not be graded...
- **WRITE CLEARLY!**
- **MOLECULAR MODELS ARE ALLOWED**
- **DO NOT USE RED INK**
- **DON'T CHEAT, USE COMMON SENSE!**

1 nomenclature /122 acids /163 reactions /324 C-C bonds /185 Retro /366 mechanisms /367 spectrum /25

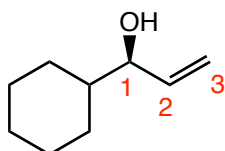
Extra Credit \_\_\_\_\_ /5

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

<b>H</b> <b>Li Be</b> <b>Na Mg</b> <b>K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr</b> <b>Rb Sr Y Zr Nb Mo Tc Ru Rh Pd Ag Cd In Sn Sb Te I Xe</b> <b>Cs Ba Lu Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn</b>	<b>He</b> <b>Ne</b> <b>Ar</b> <b>Kr</b> <b>Xe</b> <b>Rn</b>																				
<b>B C N O F</b> <b>Al Si P S Cl</b>	<b>Interaction Energies, kcal/mol</b>																				
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: left;">Eclipsing</th> <th colspan="2" style="text-align: left;">Gauche</th> </tr> </thead> <tbody> <tr> <td>H/H</td> <td style="text-align: right;">-1.0</td> <td>Me/Me</td> <td style="text-align: right;">-0.9</td> </tr> <tr> <td>H/Me</td> <td style="text-align: right;">-1.4</td> <td>Et/Me</td> <td style="text-align: right;">-0.95</td> </tr> <tr> <td>Me/Me</td> <td style="text-align: right;">-2.6</td> <td>i-Pr/Me</td> <td style="text-align: right;">-1.1</td> </tr> <tr> <td>Me/Et</td> <td style="text-align: right;">-2.9</td> <td>t-Bu/Me</td> <td style="text-align: right;">-2.7</td> </tr> </tbody> </table>	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
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Question 1 (12 pts.) Give an unambiguous IUPAC or common name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



1-cyclohexylprop-2-en-(1S)-ol

OR

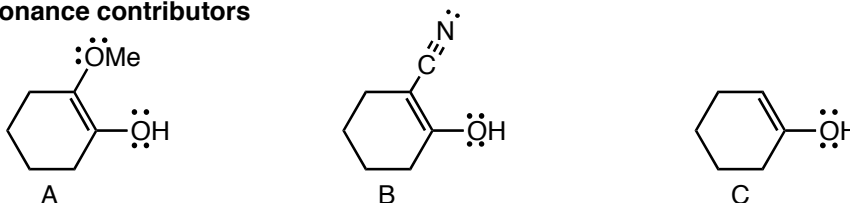
(S)-1-cyclohexylprop-2-en-1-ol

OR

(1S)-cyclohexylprop-2-en-1-ol etc.

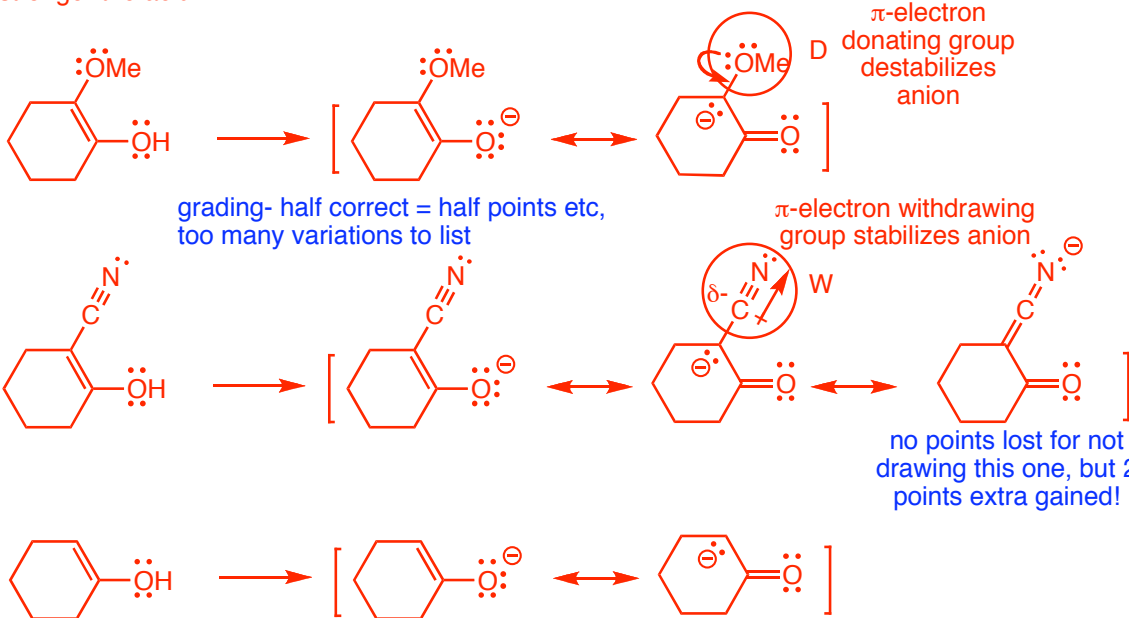
grading- subtract 2 points each error, do not propagate errors

Question 2 (16 pts). Rank the following enols in order of INCREASING Bronsted acidity, give a BRIEF explanation (ignore keto isomers). **Your explanation must include drawings of any relevant resonance contributors**



A < C < B  
weakest < < strongest

acidity is determined by the stability of the anion conjugate base, the more stable the base, the stronger the acid



5 pts Extra Credit. An enediyne of the kind shown has been found to crosslink which biological molecule?



DNA

proteins

fatty acids

steroids

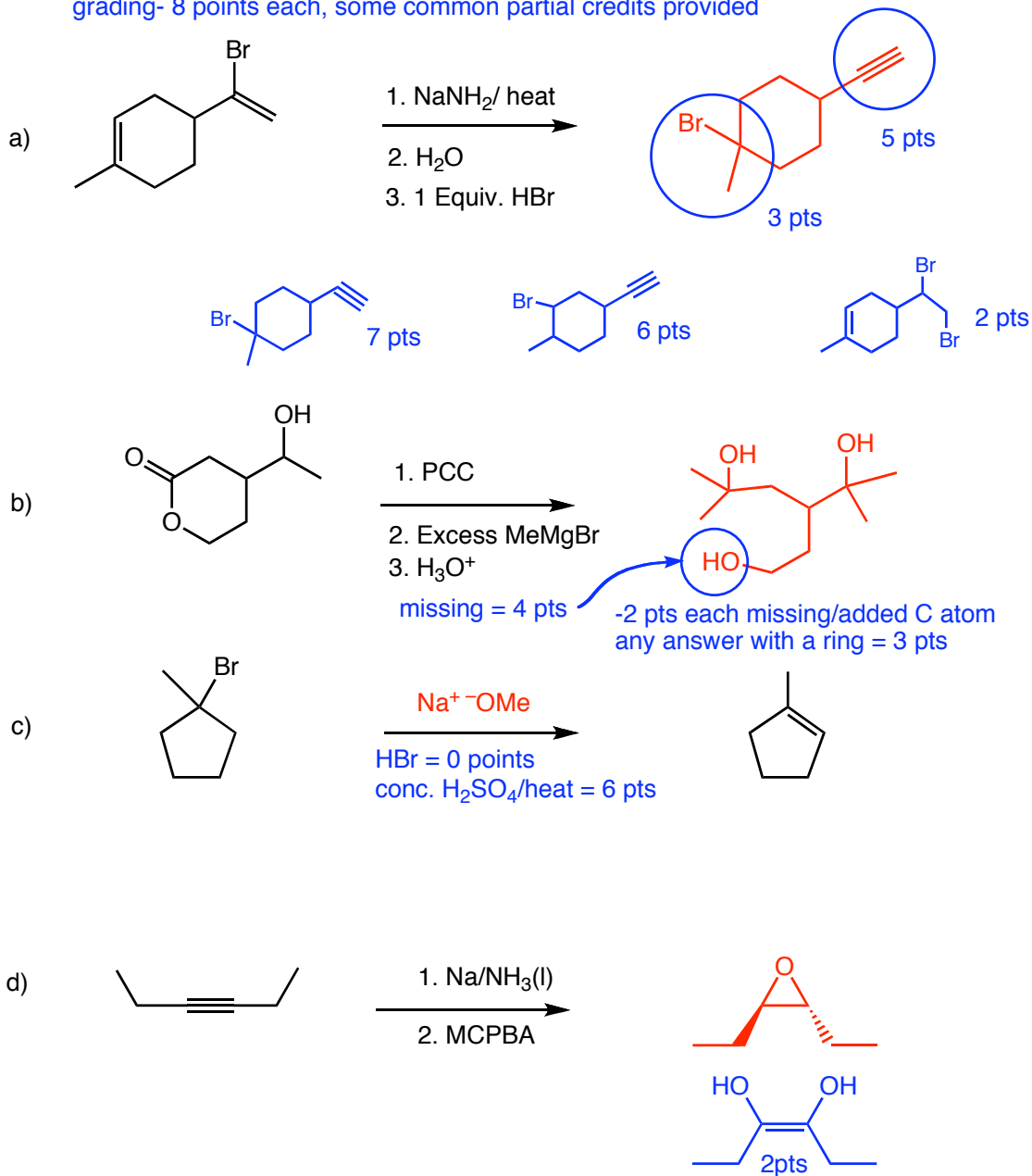
grading- subtract 2 points or zero points

from "O-Chem in Real Life" page : unusual alkyne, week #2

## Question 3 ( 35 pts.)

Provide the missing **major organic product, the reagents and conditions, or the reactant** for the following reactions, as appropriate. Ignore stereochemistry.

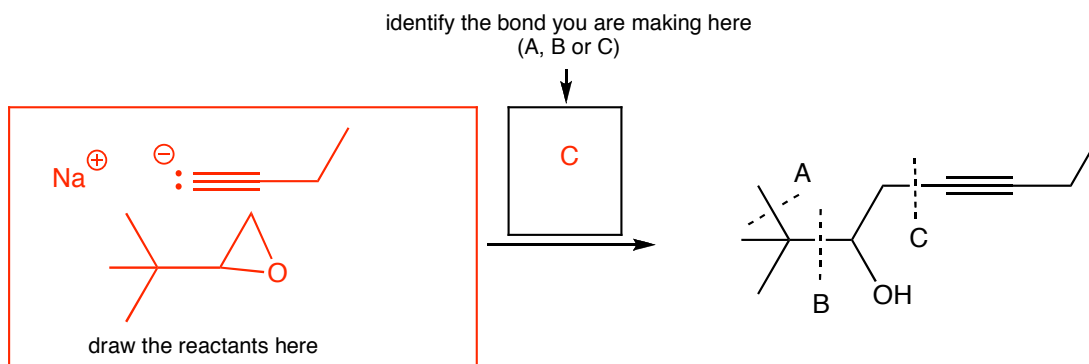
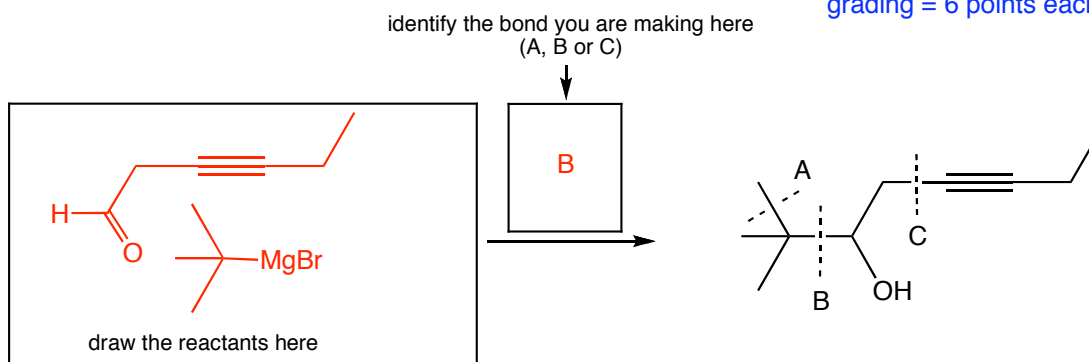
grading- 8 points each, some common partial credits provided



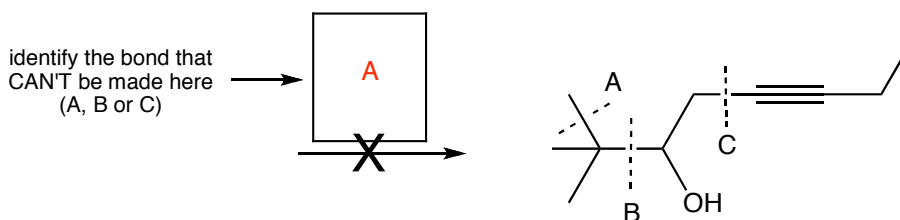
Question 4 (18 pts.) For the bonds labelled A, B and C in the structure provided:

a) Identify the TWO bonds that CAN be made using either a Grignard or an acetylide reaction. In each case, **draw the structure of the acetylide anion or the Grignard reagent AND the other structure it would react with. Do not include any acid workup hydrolysis steps, assume that they will be included as required.**

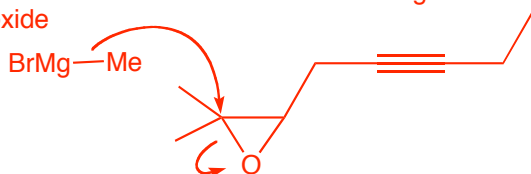
grading = 6 points each



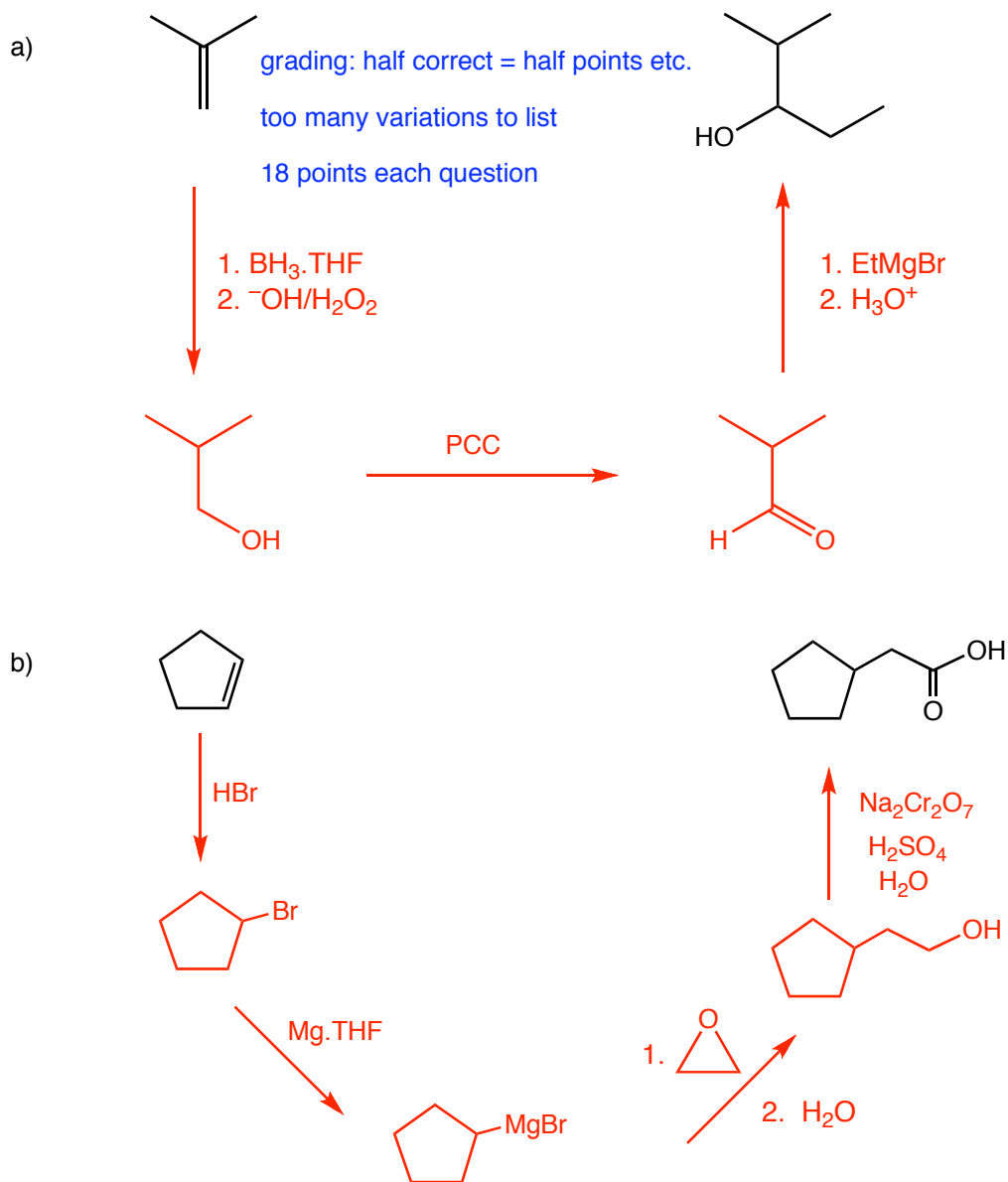
b) Identify **ONE** bond that can NOT be made using an acetylide or Grignard reaction, and give the reason why.



this bond can NOT be made because..... the Grignard would have to add to the most substituted end of an epoxide

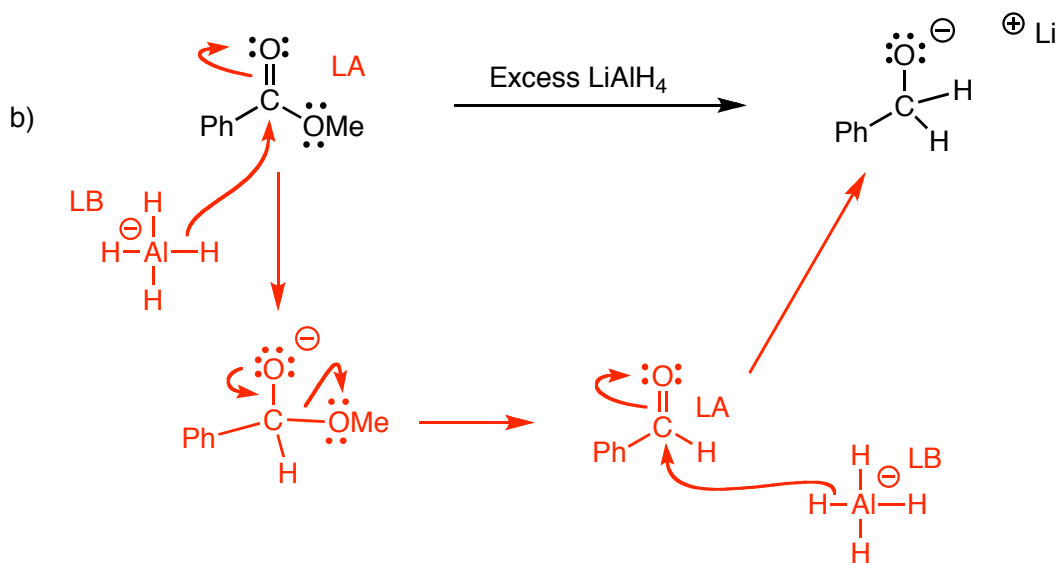
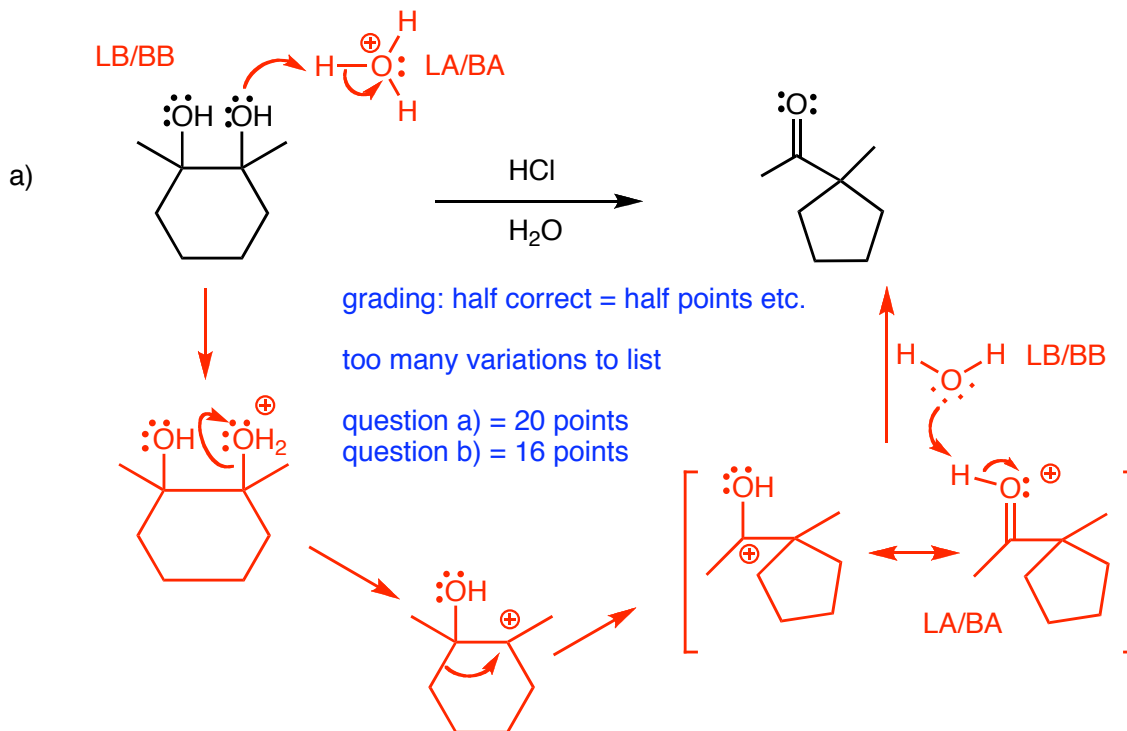


Question 5 (36 pts.) Show how you would synthesize the target compounds on the right from the starting compounds on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.



Question 6 (36 pts). **READ THIS QUESTION CAREFULLY!!** For **EACH** reaction, give a complete arrow pushing mechanism, and...

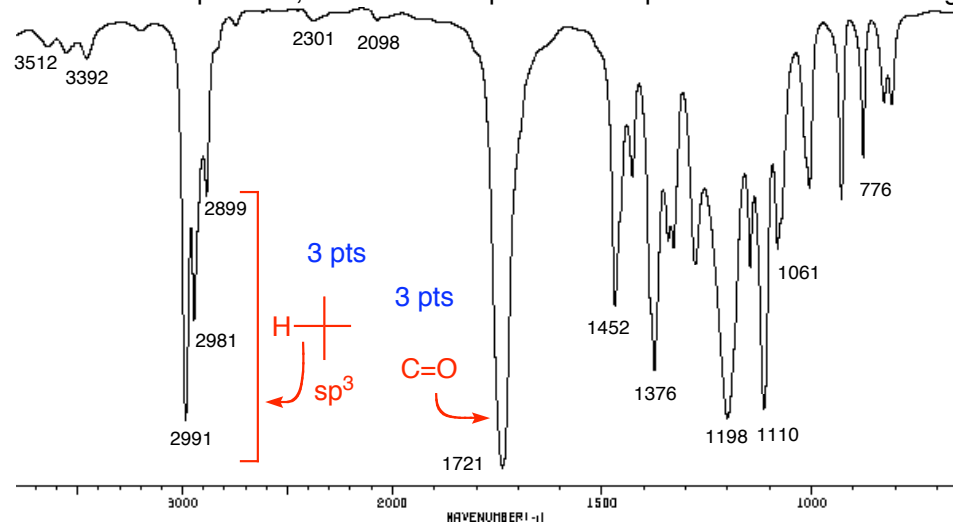
- 1) Show **ALL** important resonance structures of any intermediates.
- 2) Add non-bonding electrons and C-H bonds to the line-angle structures as required.
- 3) Indicate the Lewis acid/Lewis base (LA, LB) at each step as appropriate, and whether they are also Brønsted acids/bases (LA/BA, LB/BB).



Question 7 (25 pts) Provided are spectra for a compound with molecular formula  $C_6H_{12}O_2$

a) Give the degrees of unsaturation 1 degree of unsaturation 2 pts

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)

