

Fall Semester Organic Chemistry I
Mid-Term Exam 2

Name (print): *Answer Key*

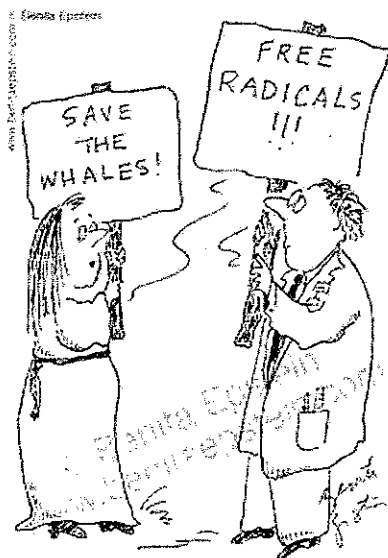
Name (Sign) :

Instructions

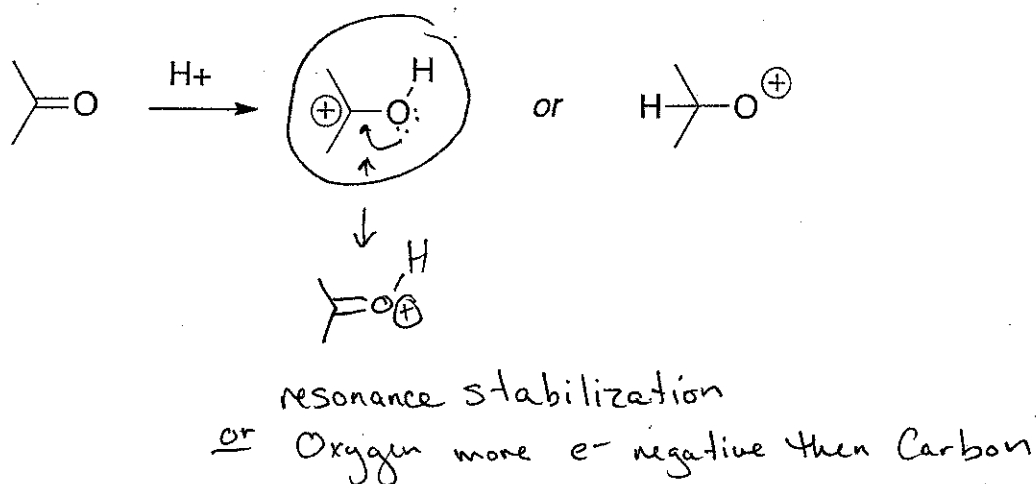
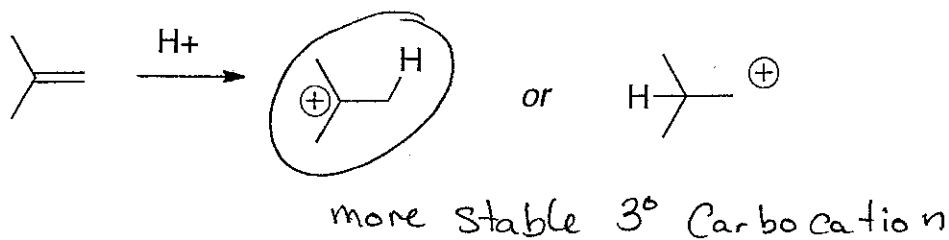
1. Keep the exam closed until you are instructed to begin.
2. The exam consists of 7 questions. The first thing you should do is make sure that no pages are missing. If a page is missing, notify a proctor immediately.
3. You will have 1 hr and 15 minutes to complete the exam, at which time pencils must be put down. Budget your time wisely.
4. Make sure to show all of your work, and make it clear what your thought process was. Answers should fit in the space provided. If you need to use the back of the sheet of paper, you must make note of it in the space allotted for credit.

Breakdown

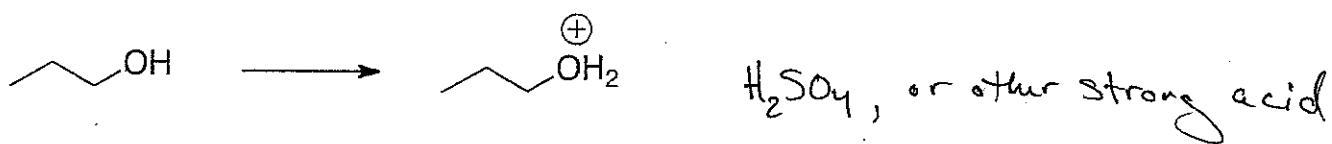
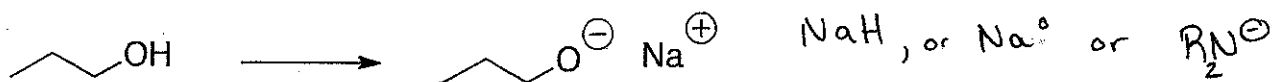
1. ____ / 10
2. ____ / 10
3. ____ / 20
4. ____ / 20
5. ____ / 20
6. ____ / 10
7. ____ / 10
total ____ / 100



1) Protonation of alkenes or carbonyls with acids leads to which of the following cations. Explain your answer (10 points, 5 points each)

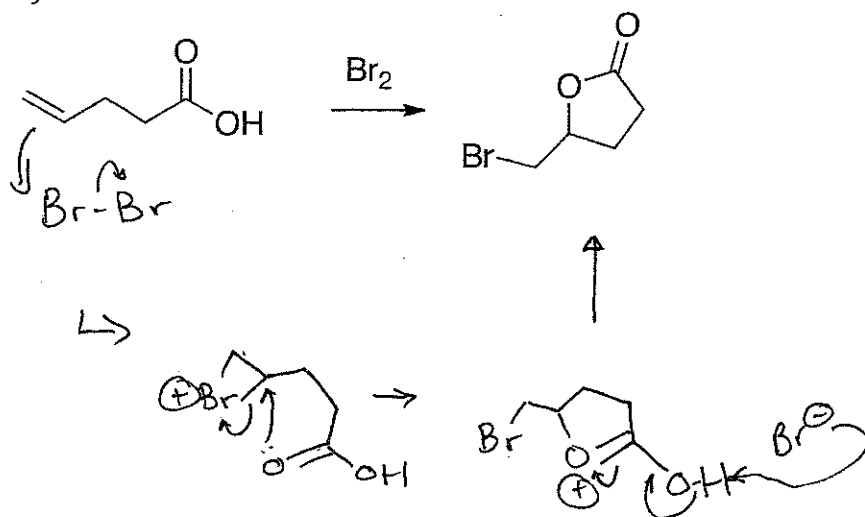


2) Alcohols can be converted into either nucleophilic or electrophilic species using simple acid/base chemistry. Show a reagent that can carry out the following modification.
 (10 points, 5 points each)

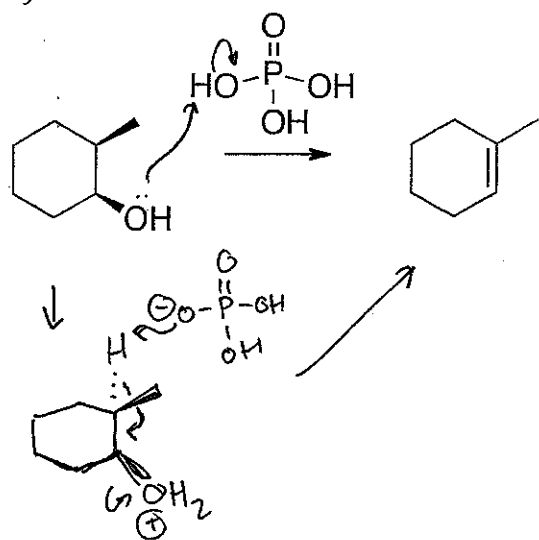


3) Show a mechanism for the following reactions. (20 points, 10 points each)

a)



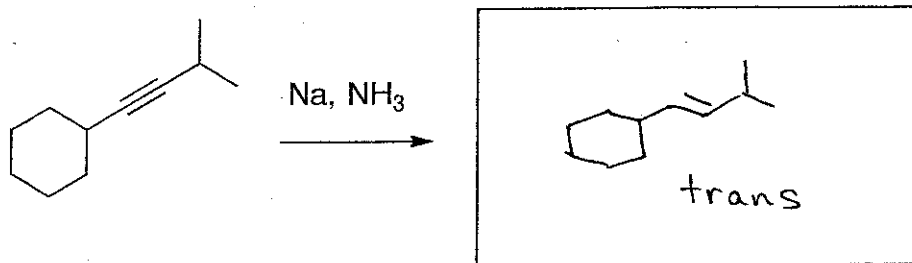
b)



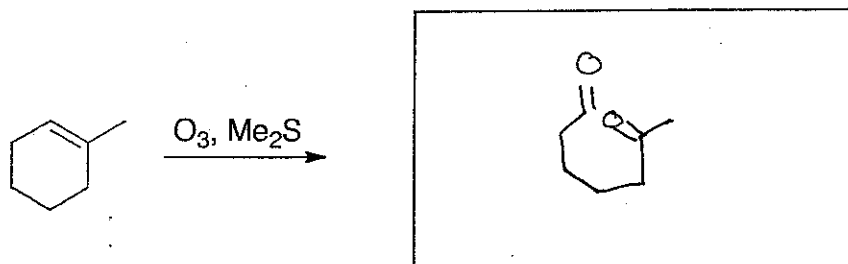
Shown as $\text{SN}2/\text{E}2$, but could also be $\text{E}1$ mechanism

4) Fill in the missing product or reagent in the following reactions (20 points, 4 points each).

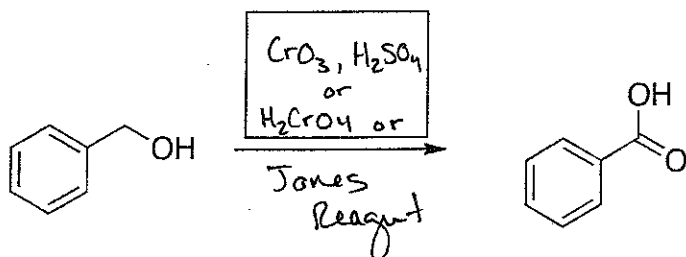
a)



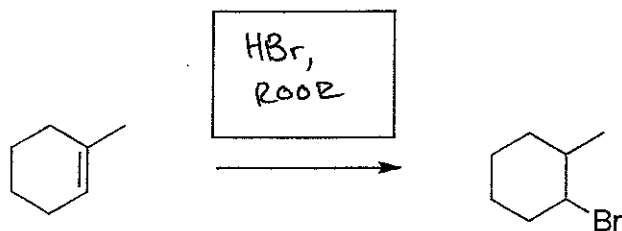
b)



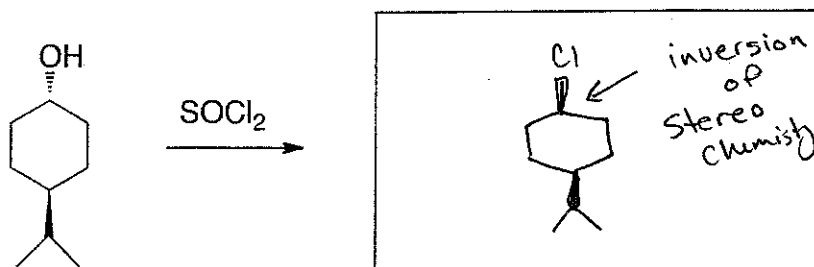
c)



d)

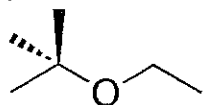


e)

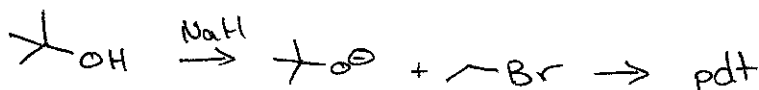
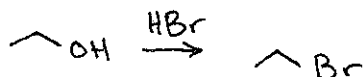
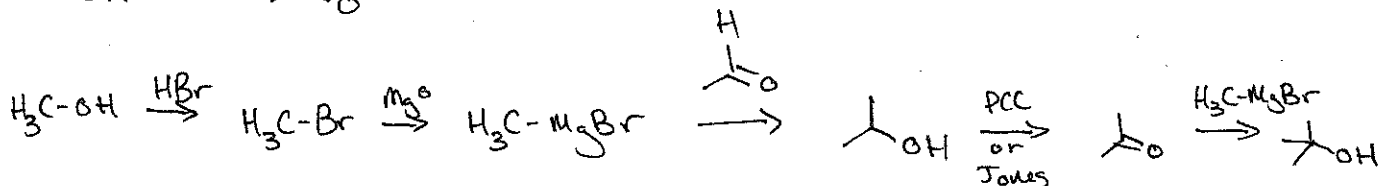
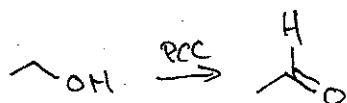


5) Propose a synthesis for the following molecules using methanol and ethanol as your only carbon-containing starting materials. (20 points, 10 points each)

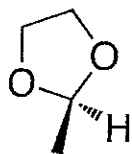
a)



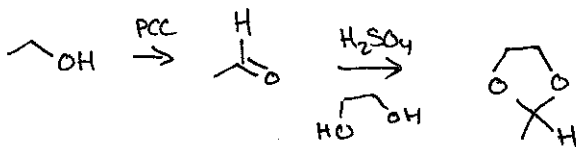
one possible answer



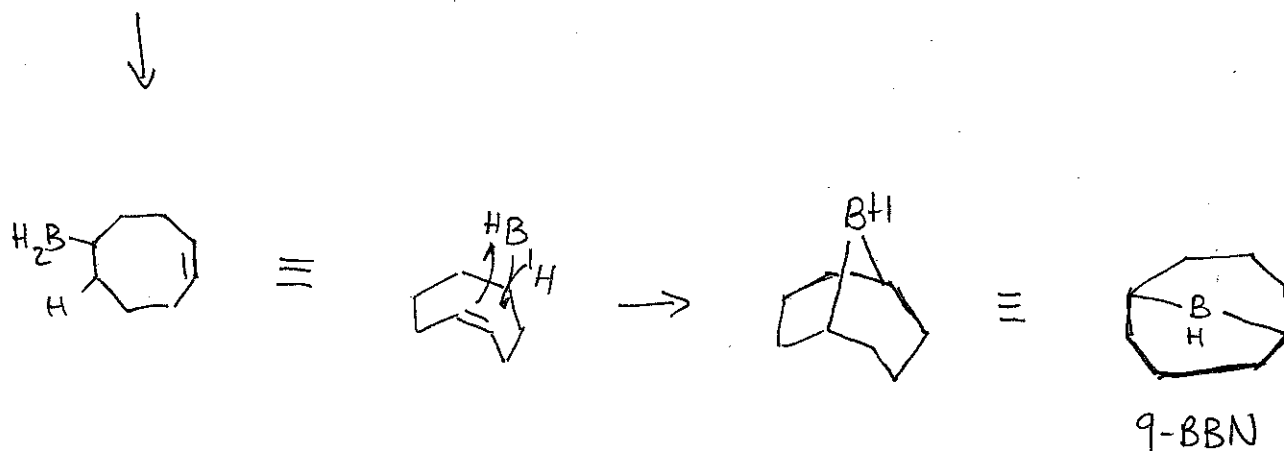
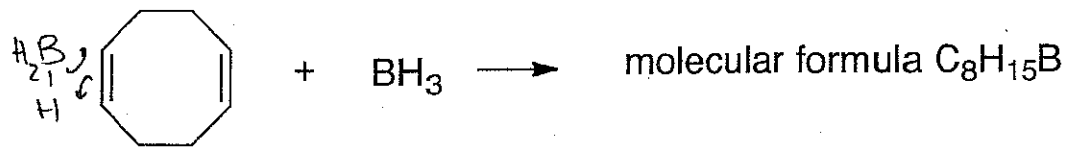
b)



one possible answer



6) The following is the synthesis 9-borobicyclo[3.3.1]nonane, a boron containing compound also known as 9-BBN. Using what information you can gain from the IUPAC name, and by thinking through the mechanism of the first step of a hydroboration/oxidation sequence, predict the structure of 9-BBN. (10 points)

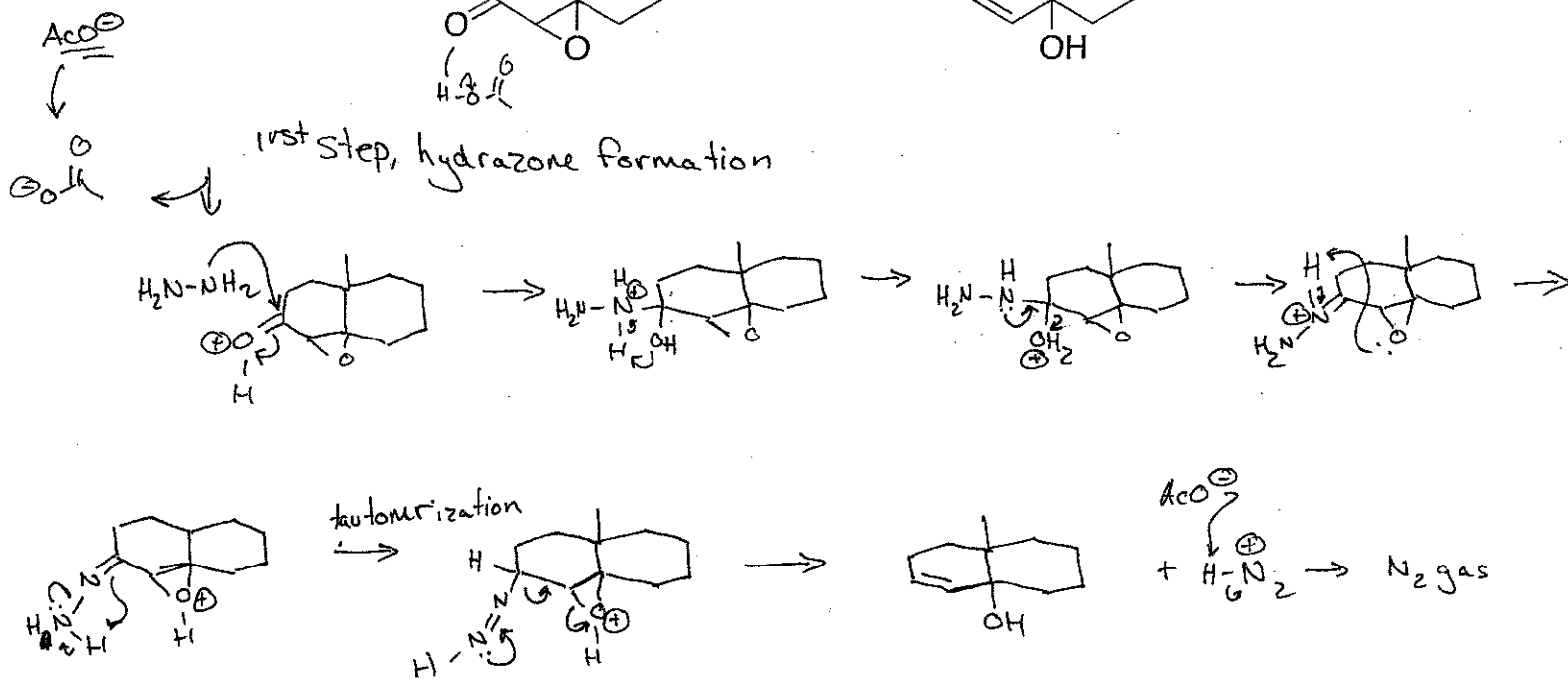
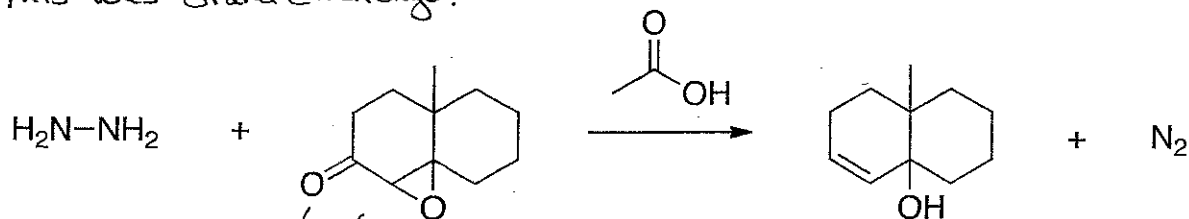


note [3.3.1]
was a hint

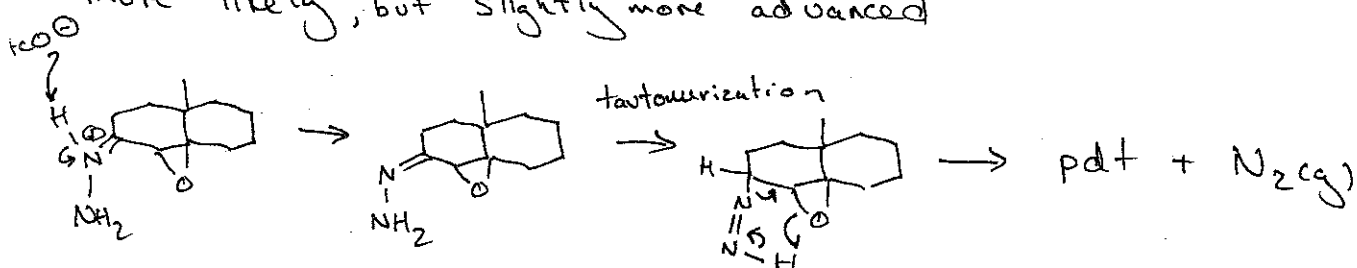


7) The following is a reaction known as a Wharton rearrangement. Show a mechanism for this transformation. (10 points)

This was Grand Challenge!



more likely, but slightly more advanced



Bonus Question (2 points). The Nobel Prize in Chemistry for 2011 was awarded to Dan Shechtman for his discovery of this type of crystal.

Answer. quasicrystals - although I guess technically they aren't, or maybe they are, crystals.