

CHM 333
Key to Semester Exam #2
October 22, 2008

E. B. Skibo

Print Name _____

Sign Name _____

Student I.D. # _____

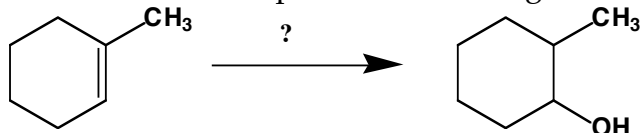
PLEASE PRINT YOUR NAME ON LAST PAGE TOO. ANSWER QUESTIONS ONLY IN THE SPACES PROVIDED. DO NOT WRITE ON THE BACK OF PAGES, I WILL NOT GRADE ANSWERS ON THE BACK OF PAGES.

1. (30 pts) Multiple choice/fill in the blanks. Put your answer in the space provided.

 E a) Which of the following compounds will react most rapidly with HCl?

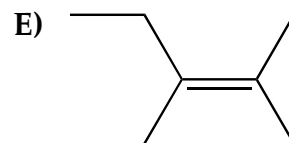
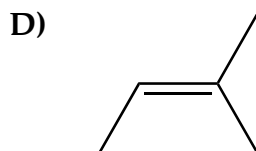
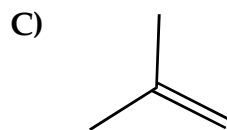
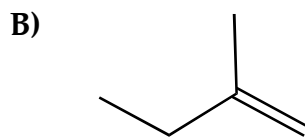
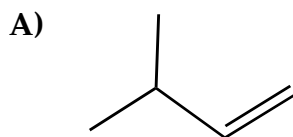
- A) 5-methyl-1-hexene
- B) 4-methyl-1-hexene
- C) (E)-5-methyl-2-hexene
- D) (E)-2-methyl-3-hexene
- E) 2-methyl-2-hexene

 E b) What reagents are needed to accomplish the following transformation?

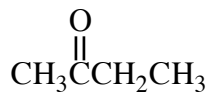


- (A) H₂O/H⁺
- (B) H₂O/Peroxide
- (C) OH⁻
- (D) BH₃
- (E) 1. BH₃ / 2. HO⁻, H₂O₂, H₂O

 E c) Which of the following is the most stable alkene?

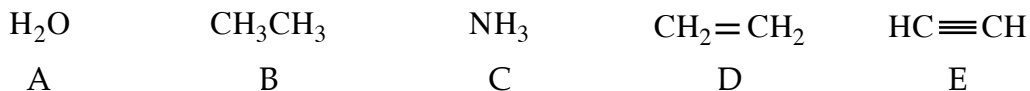


E d) Which of the following are enol forms of 2-butanone, shown below?



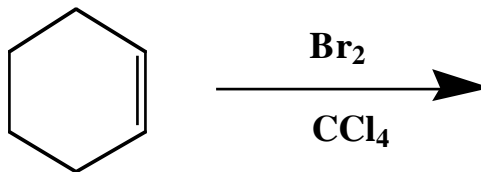
- A) $\text{CH}_3\underset{\text{OH}}{\text{C}}=\text{CHCH}_3$ and $\text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}=\text{CH}_2$
- B) $\text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}=\text{CH}_2$ and $\text{CH}_2=\underset{\text{OH}}{\text{C}}\text{CH}_2\text{CH}_3$
- C) $\text{CH}_3\underset{\text{OH}}{\text{C}}=\text{CHCH}_3$, $\text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}=\text{CH}_2$ and $\text{CH}_2=\underset{\text{OH}}{\text{C}}\text{CH}_2\text{CH}_3$
- D) $\text{CH}_3\underset{\text{OH}}{\text{CH}}\text{CH}_2\text{CH}_3$ and $\text{CH}_3\underset{\text{OH}}{\text{C}}=\text{CHCH}_3$
- E) $\text{CH}_3\underset{\text{OH}}{\text{C}}=\text{CHCH}_3$ and $\text{CH}_2=\underset{\text{OH}}{\text{C}}\text{CH}_2\text{CH}_3$

E e) Which is the correct order of decreasing acidity in the following compounds?



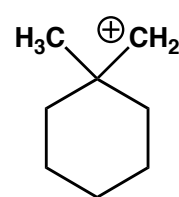
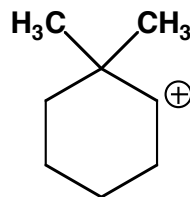
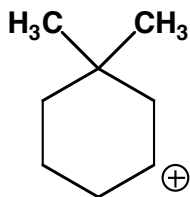
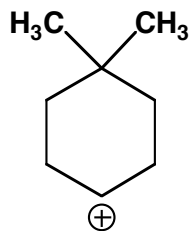
- A) $\text{E} > \text{D} > \text{B} > \text{A} > \text{C}$ B) $\text{A} > \text{C} > \text{E} > \text{D} > \text{B}$
- C) $\text{E} > \text{A} > \text{C} > \text{B} > \text{D}$ D) $\text{A} > \text{E} > \text{D} > \text{B} > \text{C}$
- E) $\text{A} > \text{E} > \text{C} > \text{D} > \text{B}$

D f) What configurations are found in the product(s) of the reaction below?



- A) 1R, 2R only B) 1S, 2S only
- C) 1R, 2S only
- D) An equal mixture of 1R, 2R and 1S, 2S
- E) An equal mixture of 1R, 2R and 1R, 2S

D g) Which of the following carbocations is likely to rearrange?



A) **I**

C) **II**

E) **III**

B) **IV**

D) **III and IV**

F) **None Rearrange**

B h) If (S)-glyceraldehyde has a specific rotation of -8.7° , what is the specific rotation of (R)- glyceraldehydes?

A) -8.7°

B) $+8.7^\circ$

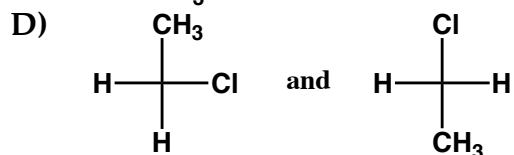
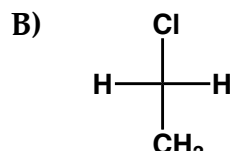
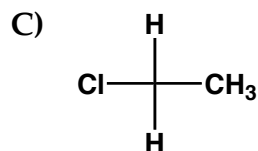
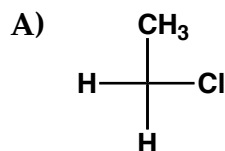
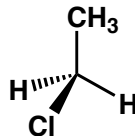
C) 0

D) $+4.3^\circ$

E) Cannot be determined from the information given

E i)

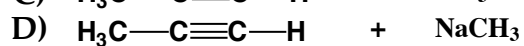
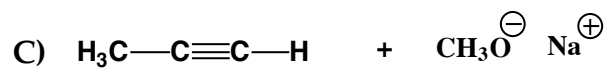
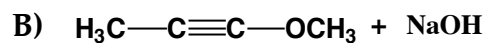
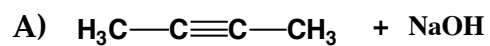
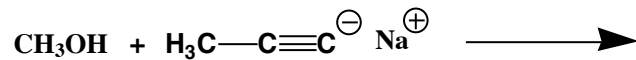
Which of the following compounds is an enantiomer of the structure below?



E) It does not have enantiomers.

C j)

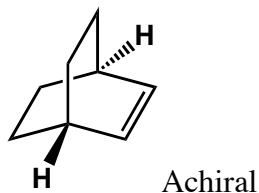
What are the products of the following reaction?



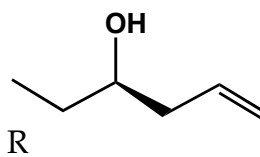
E) None of the above are products

2. (20 pts) For each stereocenter in the compounds below designate as either R or S. If there are no stereocenters write achiral.

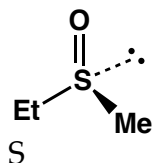
a)



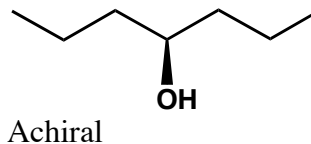
b)



c)

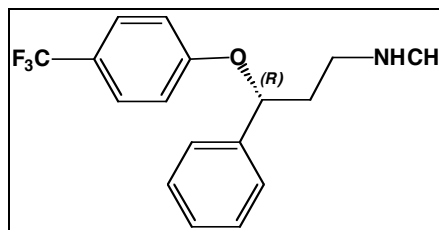
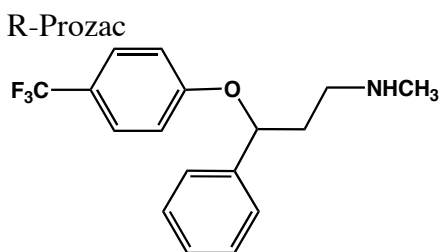


d)

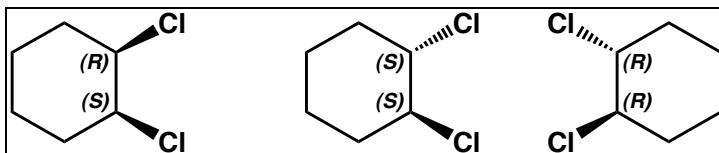


3. (20 pts) Draw a **3-dimensional** representation that corresponds to each of the following compounds.

a)

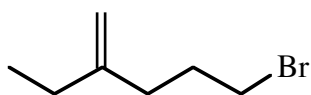


b) Draw all stereoisomers of 1,2-dichlorocyclohexane. Use bold and hashed wedges to indicate the stereochemistry.



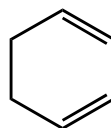
4. (30 pts) Nomenclature. Write the IUPAC or common names corresponding to each of the following structures. Use R, S, E, Z, cis or trans as needed.

a)



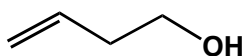
5-Bromo-2-ethyl-1-pentene

b)



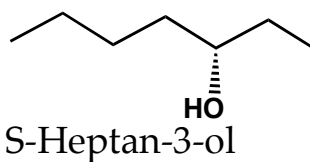
1,3-Cyclohexadiene

c)



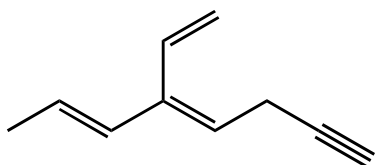
But-3-en-1-ol

d)



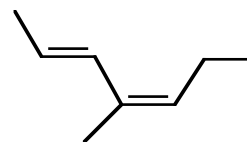
S-Heptan-3-ol

e)



(4E, 6E)-5-Vinylocta-4,6-dien-1-yne

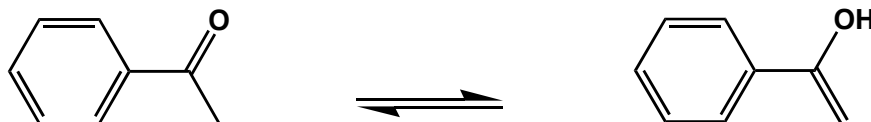
f)



(2E, 4Z)-4-Methyl-2,4-heptadiene

5. (15 pts) Drawing Tautomers. Show the enol forms of the following carbonyl compounds.

a)



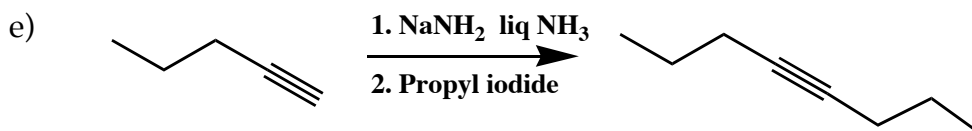
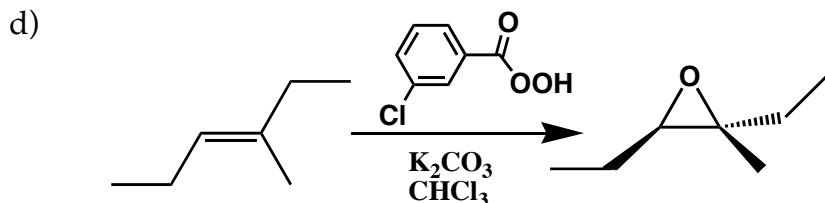
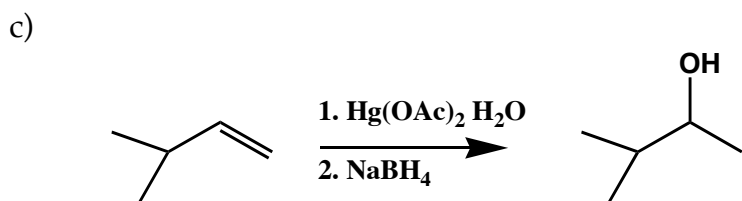
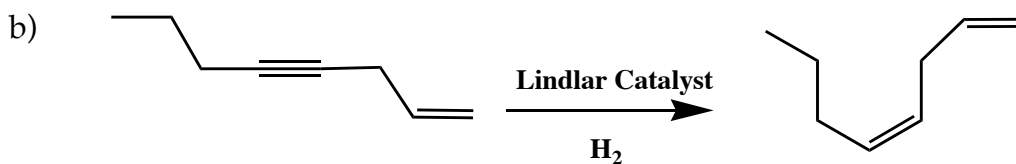
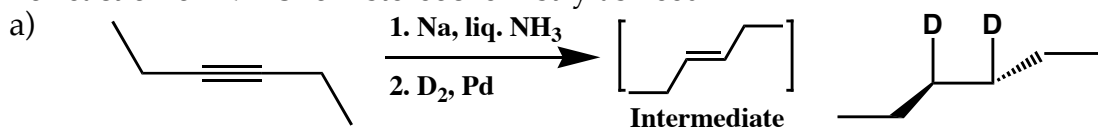
Has one tautomer

b)



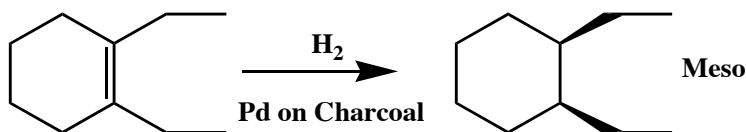
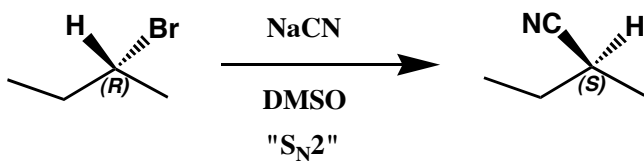
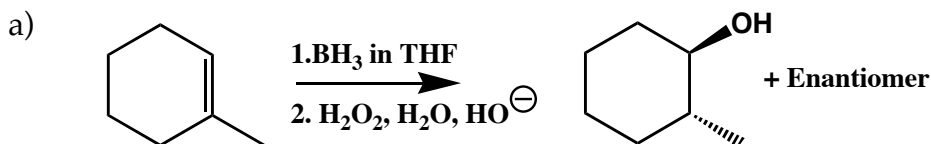
Has two tautomers

6. (25 pts) Predict the major product of each of the following reactions. If there is no reaction, write no reaction or NR. Show stereochemistry as need.

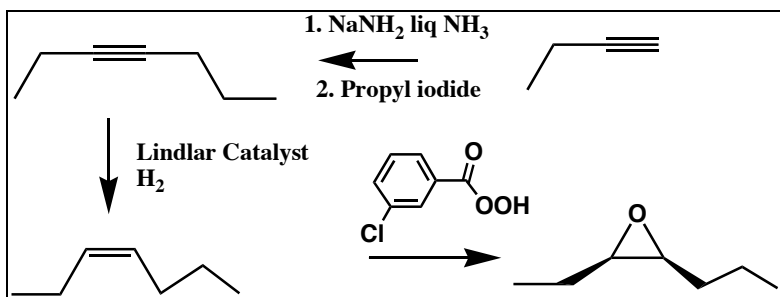
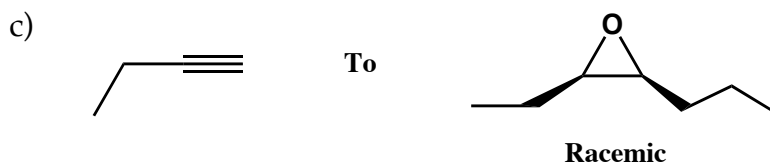
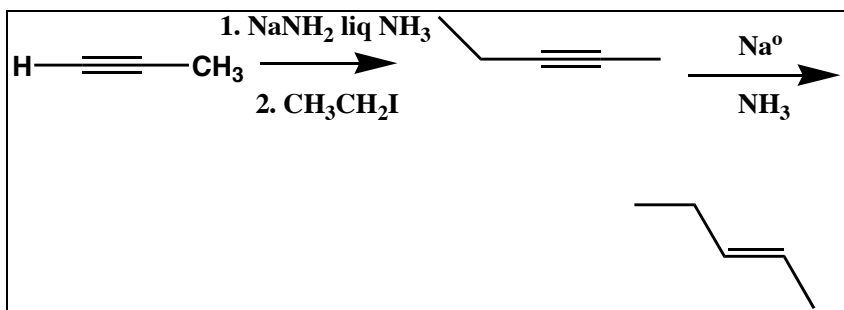
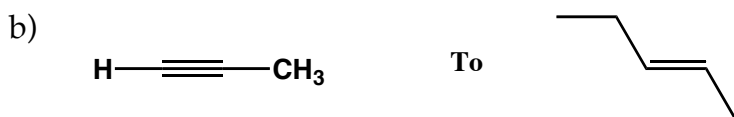
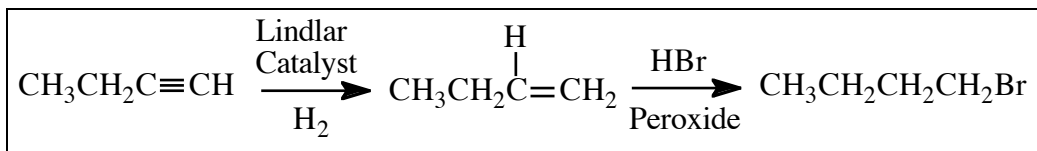


Liquid NH₃ is the solvent

7. (15 pts) Predict the product of the following reactions along with the stereochemical result (write racemic, meso or show the structure of the enantiomer which results).

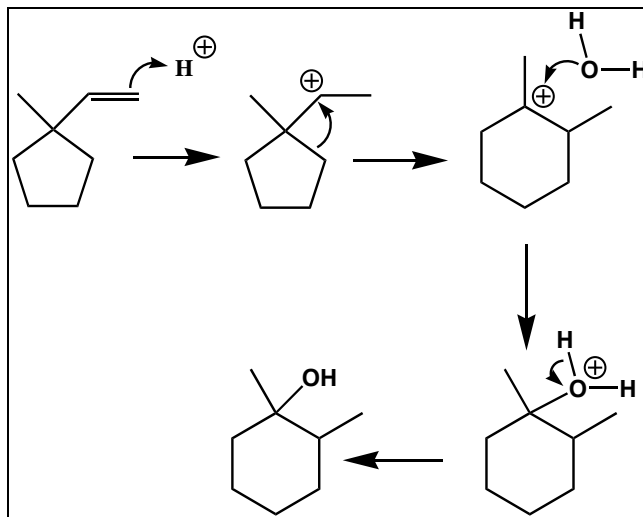
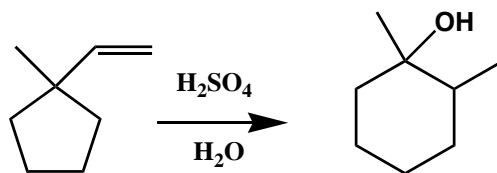


8. (30 pts) Multistep Synthesis. Starting with the starting material shown below show how the synthesis of the product can be carried out. Use any necessary carbon sources and reagents in your synthesis.



9. (15 pts) Mechanisms. Provide a mechanism for the following reactions. Show intermediates present in the reaction along with curved arrows and proton transfers.

a) 10 pts



- b) 5 pts. Show the curved arrows on the first structure that results in the corresponding reaction product:

