CHEM 3311-200, Fall 2005

Average Score = 54.8

High Score = 98

Low Score = 8

Exam 3

November 17, 2005
Professor Rebecca Hoenigman

I pledge to uphold the CU Honor Code:

Signature_____

Name (printed)_____

Last four digits of your student ID number_____

Recitation TA_____

Recitation number, day, and time_____

You have 2 hours to complete this exam.

Exams will be collected at 9:00 pm.

No model kits allowed; periodic table and scratch paper are attached.

DO NOT TURN PAGE UNTIL INSTRUCTED TO DO SO.

Put your name on ALL pages of the exam

Recitation Sections:

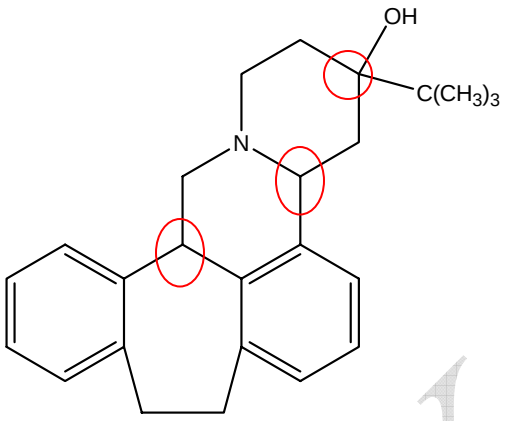
Number	Day	Time	TA
211	Monday	8 am	Kate
251	Monday	2 pm	Kate
291	Monday	5 pm	Xin
252	Tuesday	12 pm	Matt
293	Tuesday	5 pm	Jon
212	Wednesday	8 am	Greg
253	Wednesday	1 pm	Greg
292	Wednesday	5 pm	Jon
213	Friday	8 am	Xin

Answer Key

Name: _____

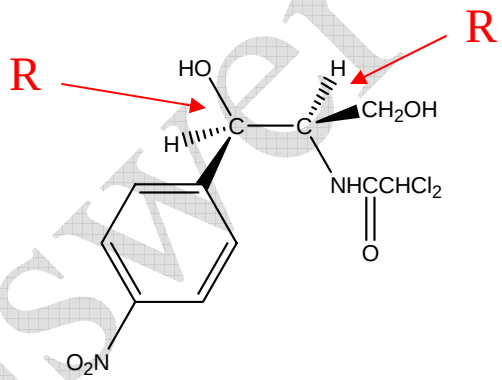
1. (2 pts) Butaclamol is a potent antipsychotic that has been used clinically in the treatment of schizophrenia. How many chirality centers does Butaclamol have? Write your answer in the box below

3



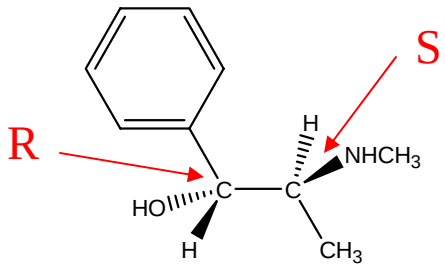
Butaclamol

2. (2 pts) Chloramphenicol is a broad-spectrum antibiotic that is particularly useful against typhoid fever. Label the configuration of each chirality center in chloramphenicol.



chloramphenicol

3. (2 pts) For many centuries, the Chinese have used extracts from a group of herbs known as ephedra to treat asthma. Chemists have been able to isolate a compound from these herbs, which they named ephedrine, that is a potent dilator of air passages in the lungs. Label the configuration of each chirality center in ephedrine.



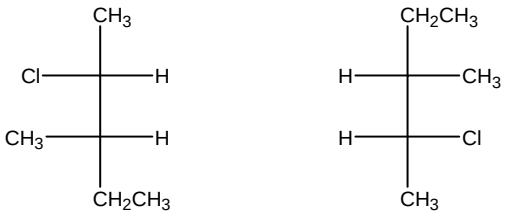
ephedrine

Answer Key

Name: _____

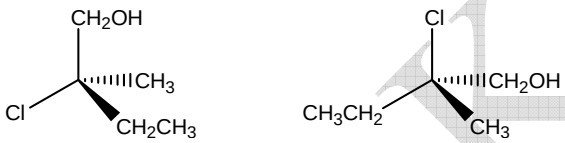
4. (10 pts) Circle the stereochemical relationship between the following pairs of isomers.

A.



(Identical) constitutional isomers enantiomers diastereomers

B.



Identical constitutional isomers (enantiomers) diastereomers

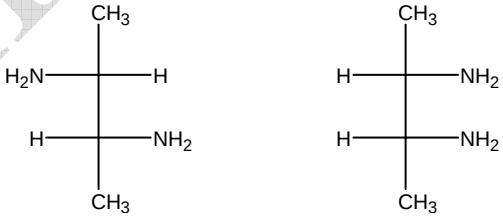
C.

Book Problem 7.33a

Identical (constitutional isomers) enantiomers diastereomers

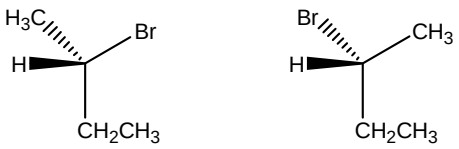
D.

Book Problem 7.28c



Identical constitutional isomers enantiomers (diastereomers)

E.

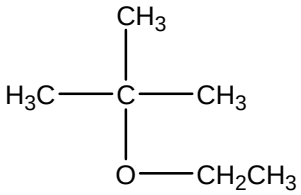


Identical constitutional isomers (enantiomers) diastereomers

Answer Key

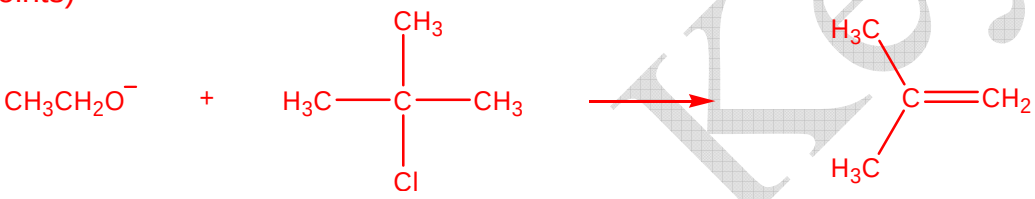
Name: _____

5. (5 pts) Dr. Don T. Doit wanted to synthesize the anesthetic 2-ethoxy-2-methylpropane. He used ethoxide ion and 2-chloro-2-methylpropane for his synthesis and ended up with no ether.

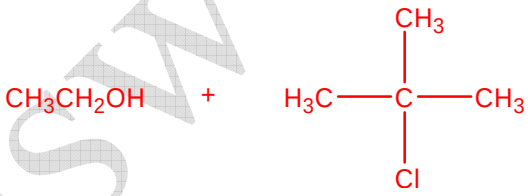


2-ethoxy-2-methylpropane

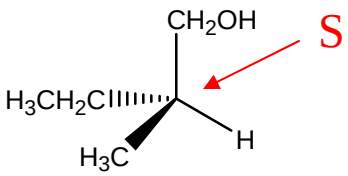
A. What was the product of his synthesis?
(3 points)



B. What reagents should he have used?
(2 points)



6. (4 pts) The compound below has a specific rotation of -5.75°. A mixture of this compound and its enantiomer rotates plane polarized light +3.62°. Calculate the percent enantiomeric excess. Is the mixture enriched in the (*R*) or (*S*) enantiomer?



% ee = $\frac{+ 3.62}{+ 5.75}$ x 100

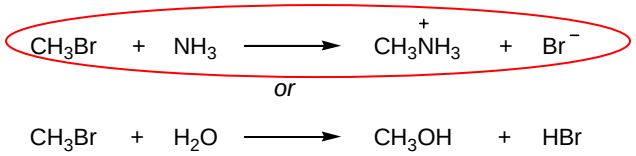
= 63.0 % excess of the R enantiomer

Answer Key

Name: _____

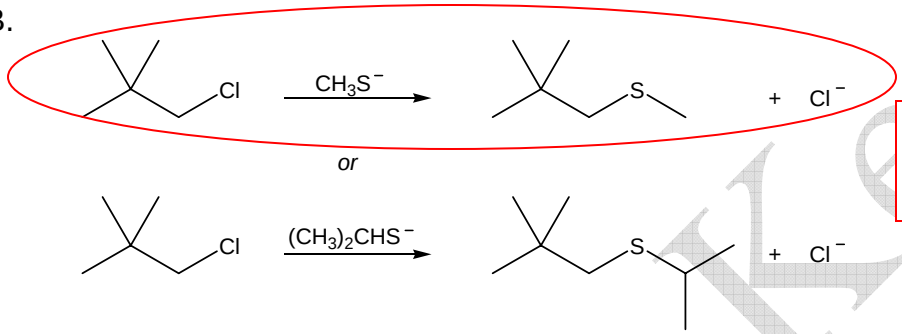
7. (10 pts) Which reactions in the following pairs will take place more rapidly? Circle your answer.

A.



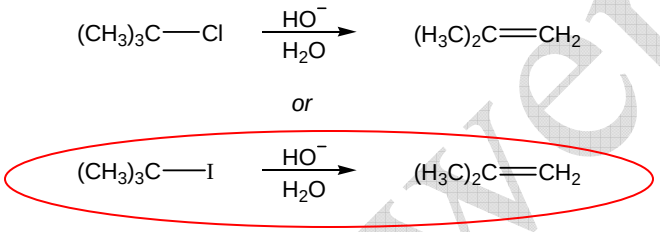
NH_3 is a better nucleophile than H_2O.

B.



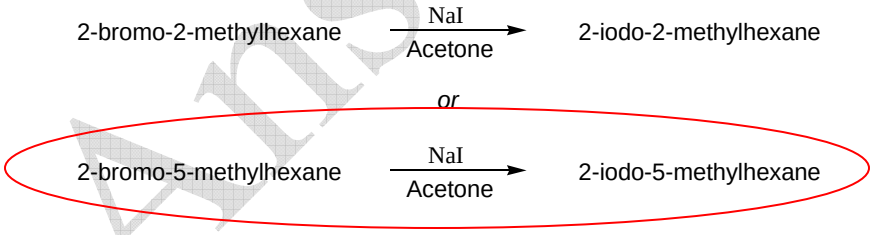
CH_3S^- is less bulky than $(CH_3)_2CHS^-$.

C.



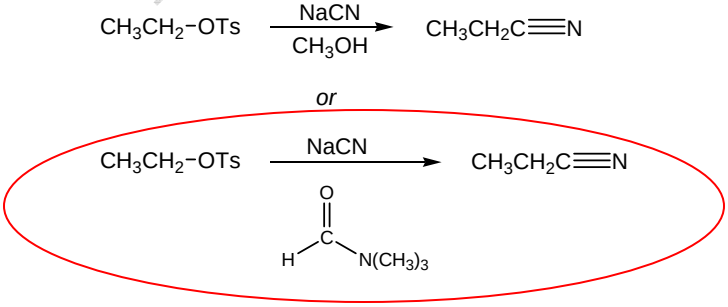
I^- is a better leaving group than Cl^-.

D.



2° alkyl halides react faster than 3° alkyl halides.

E.



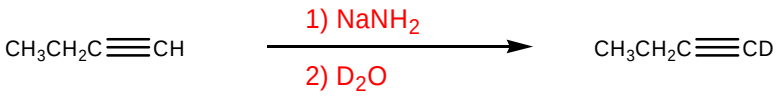
Polar aprotic solvent versus polar protic solvent.

Answer Key

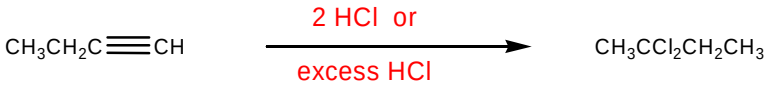
Name: _____

8. (10 pts) Fill in the missing reagents for the following reactions.

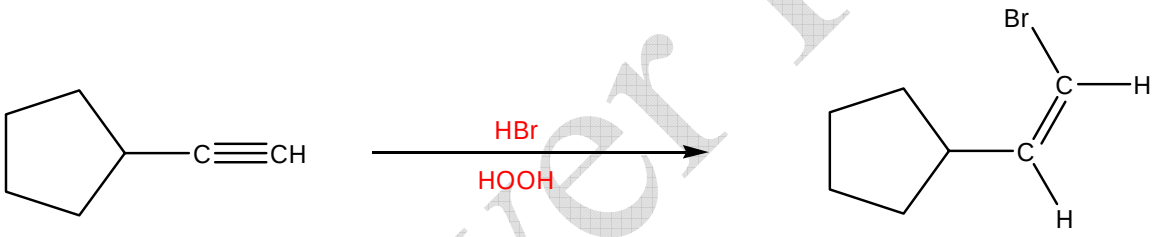
A.



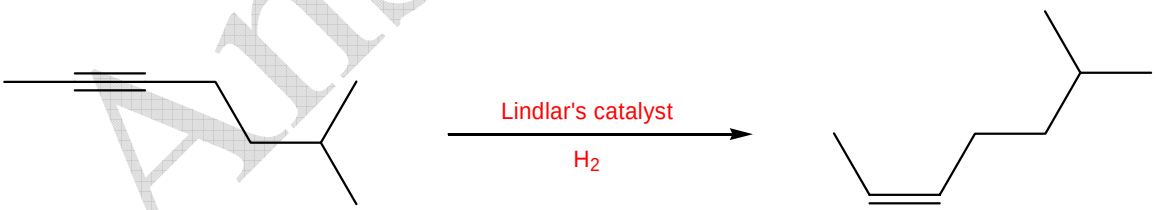
B.



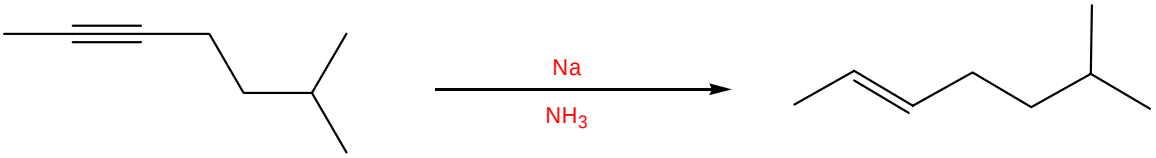
C.



D.



E.

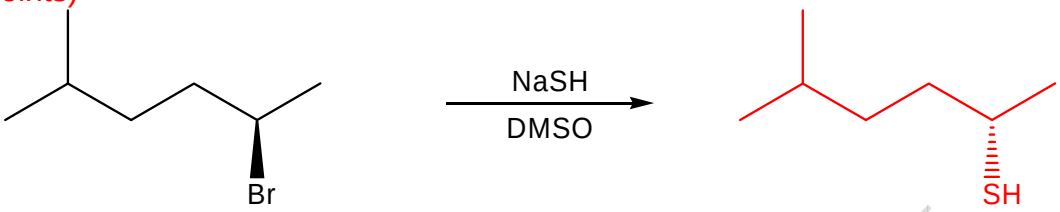


Answer Key

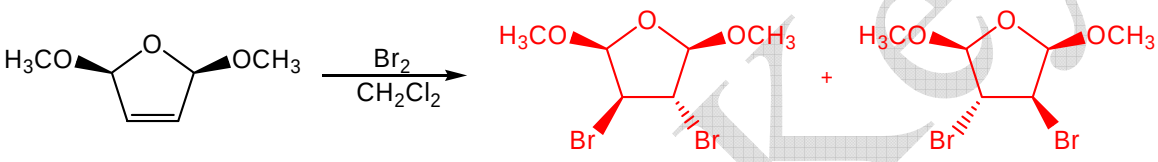
Name: _____

9. (15 pts) Give the organic products for the following reactions. If necessary, clearly label the stereochemistry of the products.

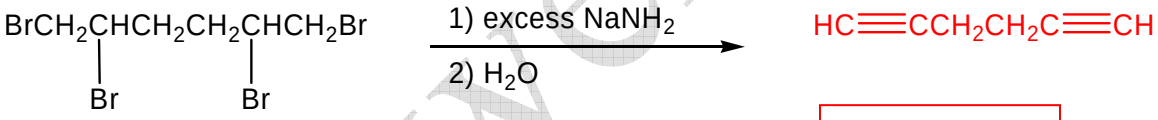
A. (2 points)



B. (4 points)

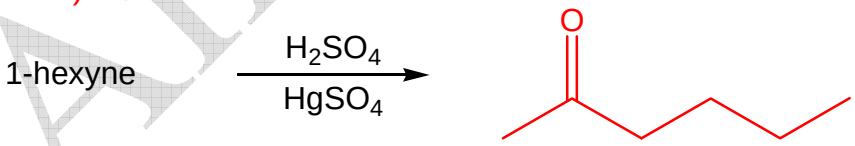


C. (2 points)



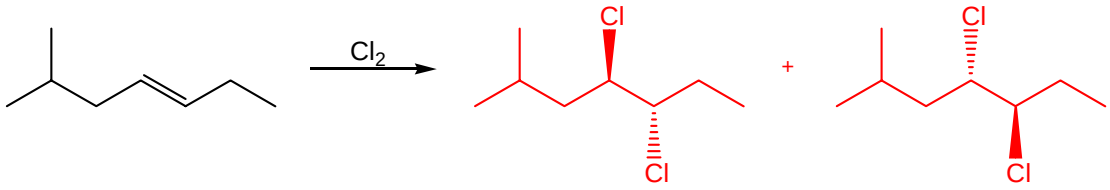
Book Problem 9.29b

D. (3 points)



Book Problem 9.25k

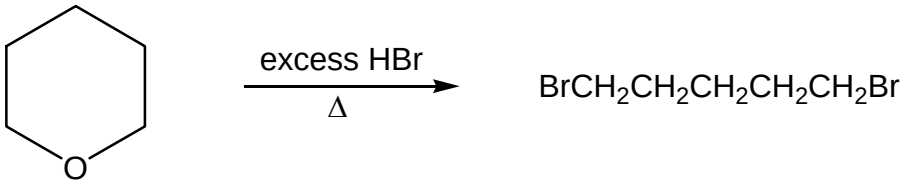
E. (4 points)

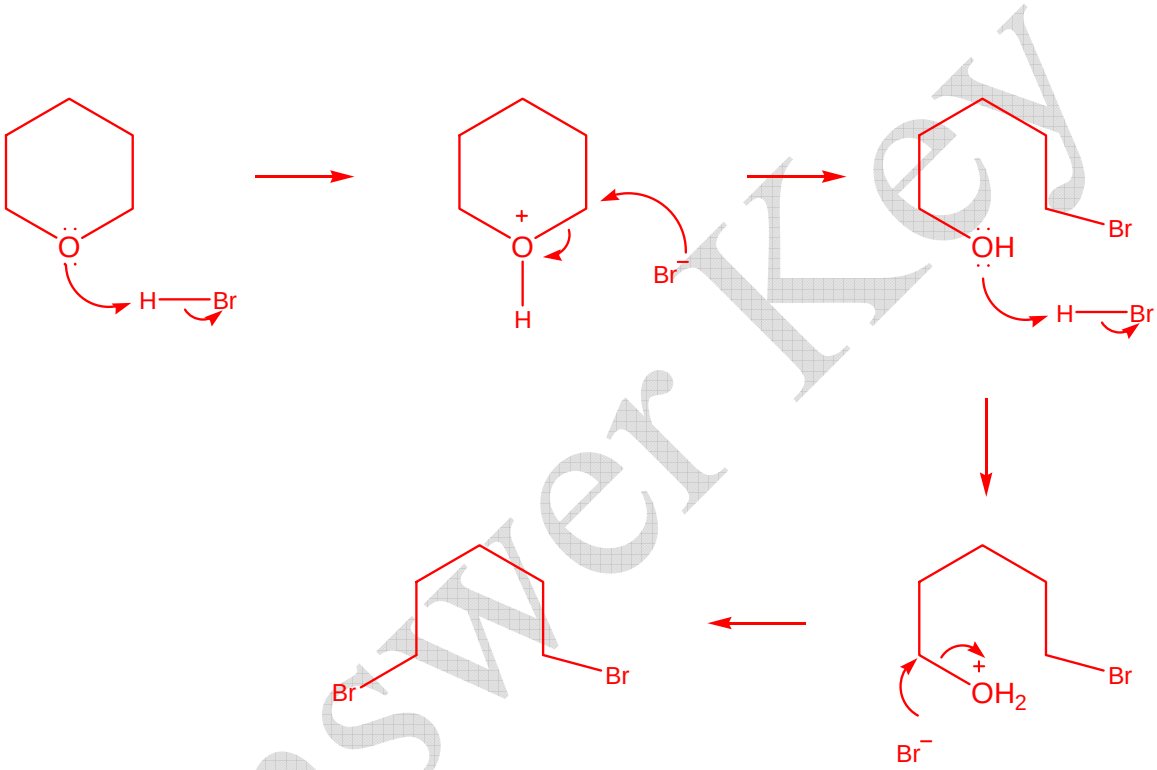


Answer Key

Name: _____

10. (10 pts) Propose a mechanism for the following reaction.



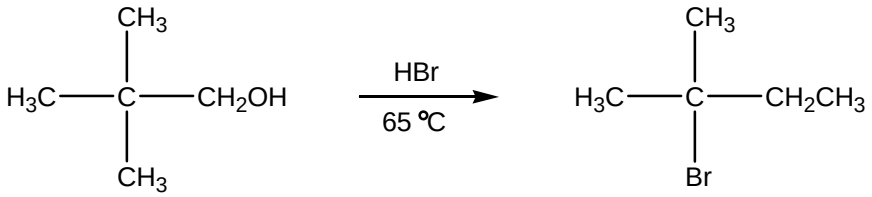


Answer Key

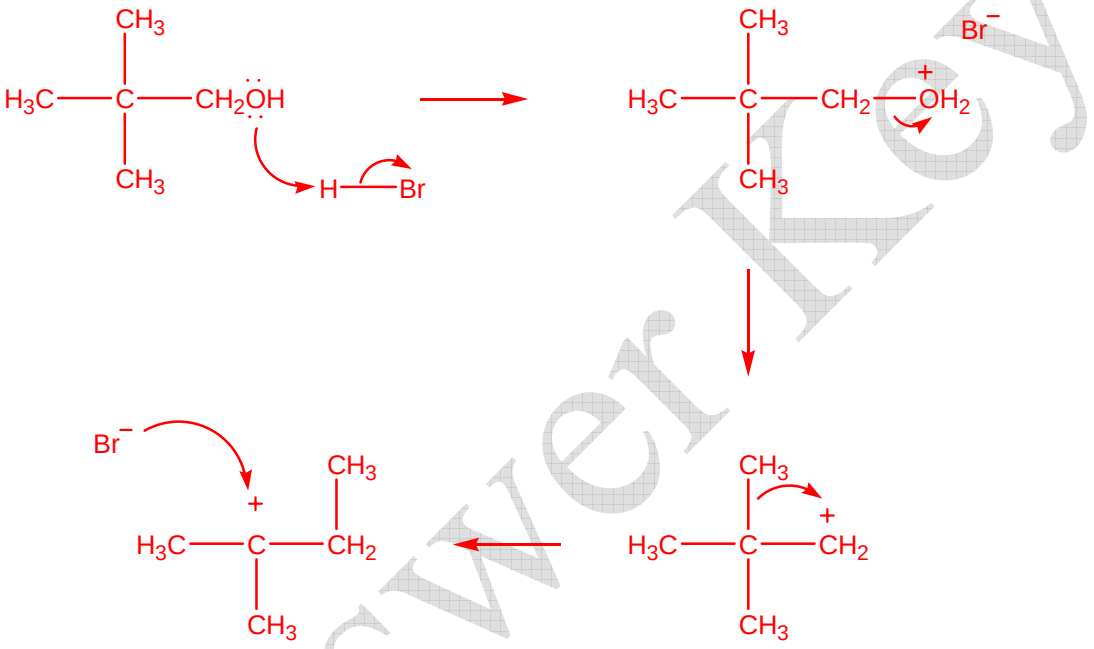
Name: _____

11. (10 pts) The reaction of 2,2-dimethyl-1-propanol with HBr is very slow and gives 2-bromo-2-methylbutane as the major product.

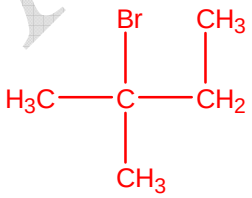
Book Problem 8.39



Give a mechanistic explanation for these observations.



Methyl shift to form more stable tertiary cation.
(The methyl shift can be concerted with water loss)

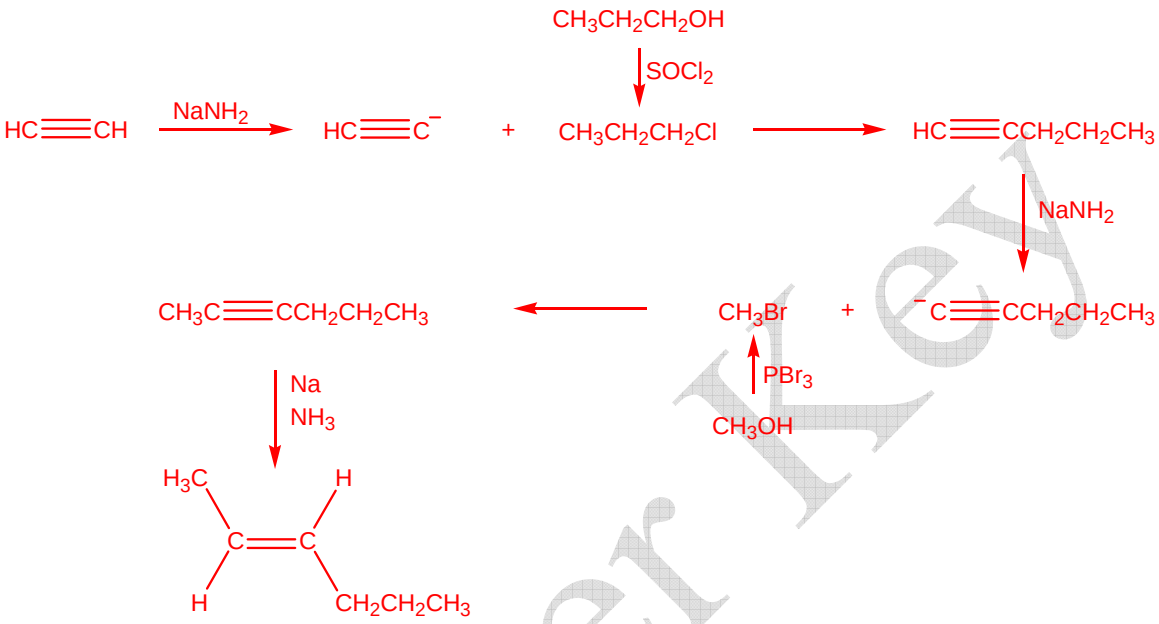


Answer Key

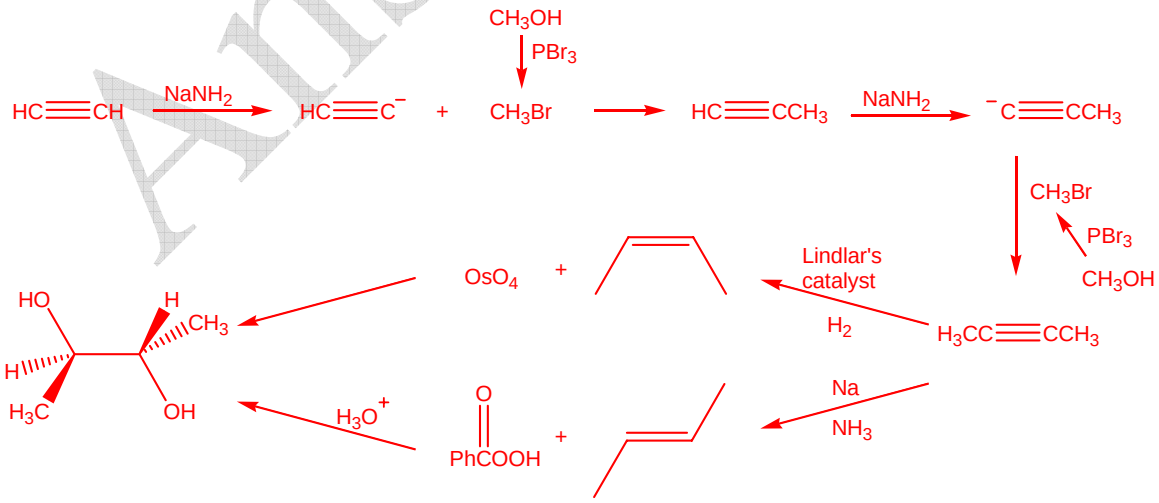
Name: _____

12. (20 pts) Propose an efficient synthesis for each of the following compounds. You may use any inorganic reagents you like and acetylene and any alcohol containing four of fewer carbons as your starting organic material.

A. *trans*-2-hexene



B. *meso*-2,3-butanediol



Answer Key

Name: _____

Score:

Page 2 _____

Page 3 _____

Page 4 _____

Page 5 _____

Page 6 _____

Page 7 _____

Page 8 _____

Page 9 _____

Page 10 _____

Total _____

Answer Key