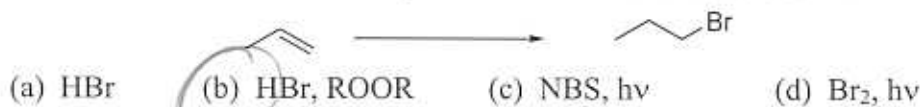


Name KCY
CHE 241, Test 2
November 5, 2004

1. Multiple choice. Choose the one best answer. (2 points each)

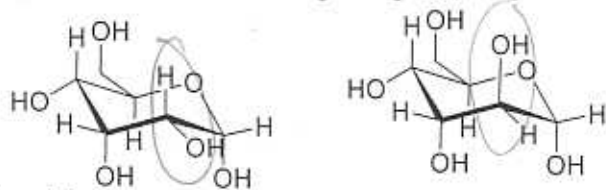
Which of the following is the best method to accomplish the transformation shown?



Which of the following compounds cannot be chiral?

- (a) 2,3-dibromobutane
(a) 1,3-dibromobutane
(a) 1,2-dibromobutane
(a) 1,4-dibromobutane
(a) 1-bromo-2-chlorobutane

What is the relationship between the following compounds?

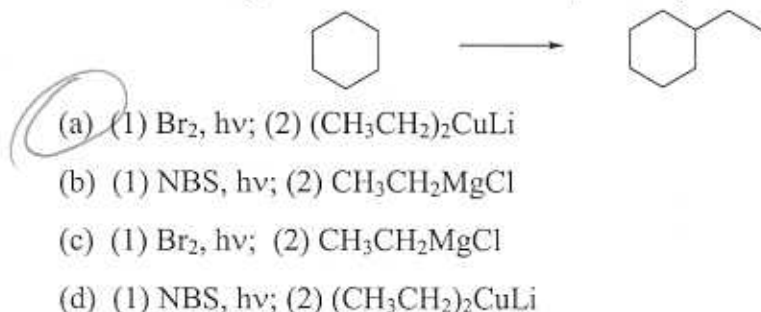


- (a) constitutional isomers
(b) enantiomers
(c) diastereomers
(d) identical compounds

Which of the following is the best way to synthesize 2,2-dibromopropane?

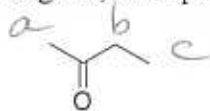
- (a) propene + Br₂
(b) propene + Br₂, hv
(c) propyne + 2 HBr
(d) propyne + 2 HBr, ROOR

Which of the following is the most effective way to carry out the transformation shown?



7 above
70
13 below
70
11 below
60
90+ ||
80+ |
70+ |||
60+ ||
50+ |||
40+ |||
<40 |||
high 98
low 31
medium 55

2. Predict how the ^1H NMR spectrum will appear for the following compound, paying attention to relative chemical shifts, integrals, and splitting. (10 points)

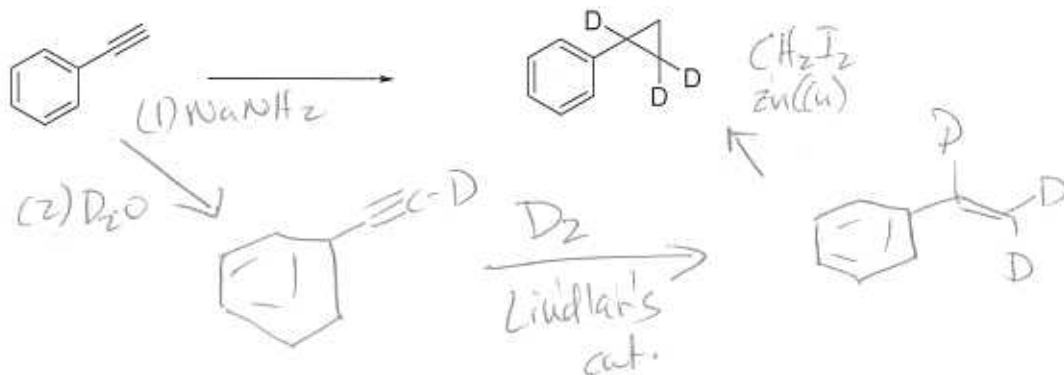


- a Singlet 3H ~ 2.2
 b quartet 2H ~ 2.5 ppm
 c triplet 3H $\sim 1-2$ ppm

3. Propose methods to accomplish the synthetic transformations shown. (10 points each)

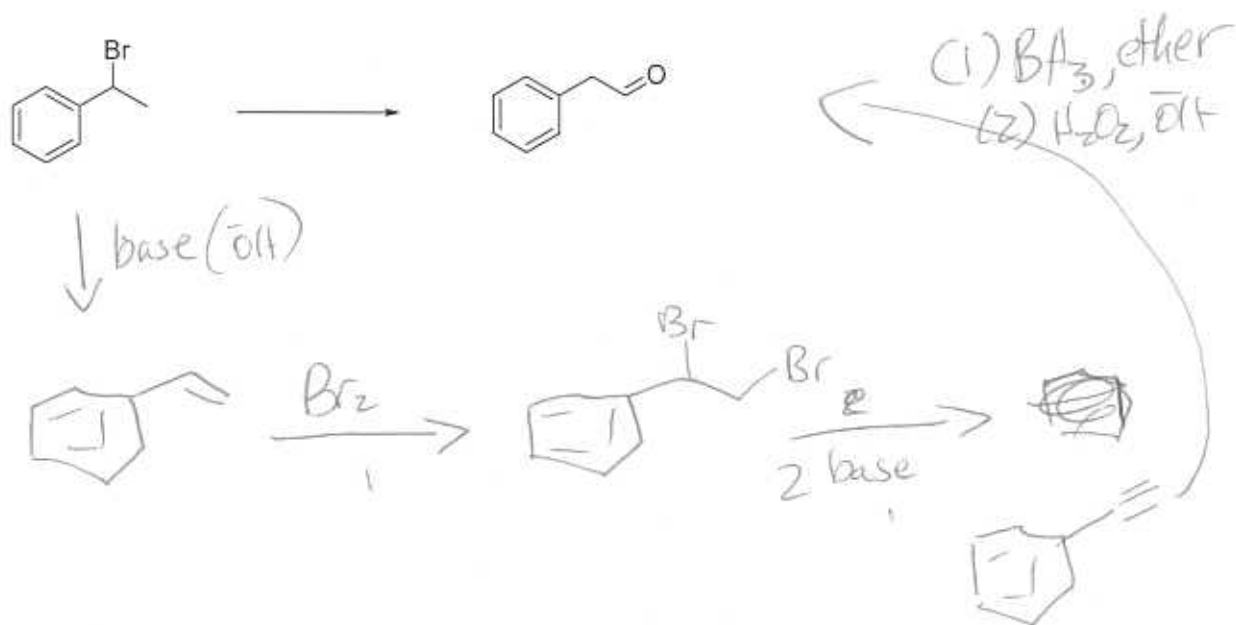
(a)

2.5 pts
 Step

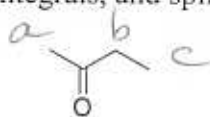


(b)

2.5 pts
 Step



2. Predict how the ^1H NMR spectrum will appear for the following compound, paying attention to relative chemical shifts, integrals, and splitting. (10 points)

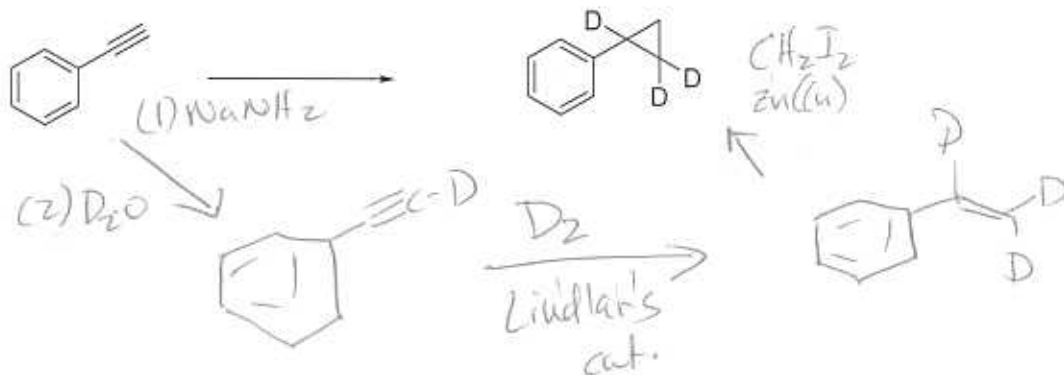


- a Singlet 3H ~ 2.2
 b quartet 2H ~ 2.5 ppm
 c triplet 3H $\sim 1-2$ ppm

3. Propose methods to accomplish the synthetic transformations shown. (10 points each)

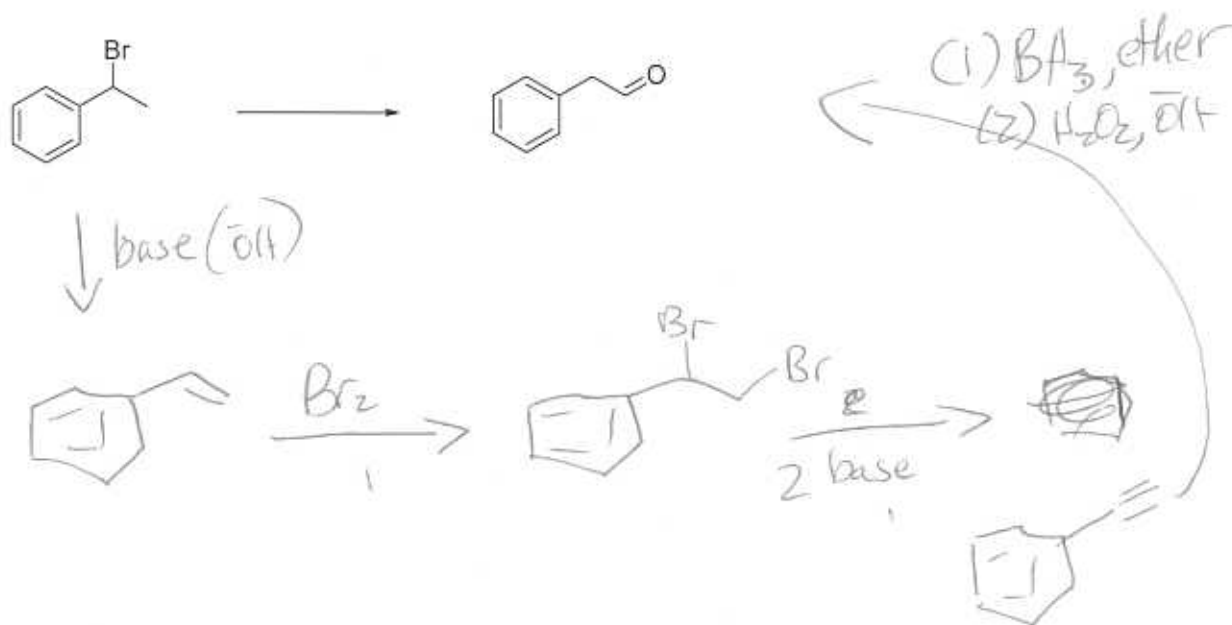
(a)

2.5 pts
 Step

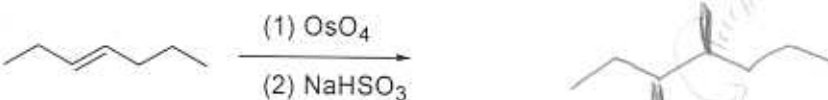
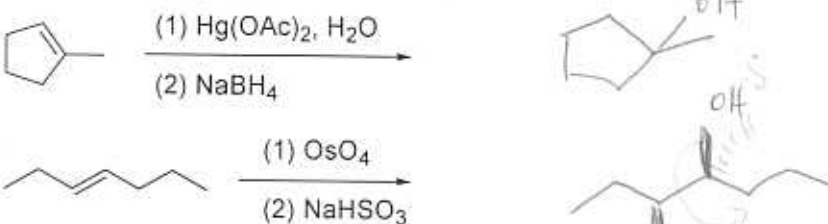
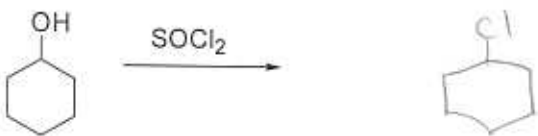


(b)

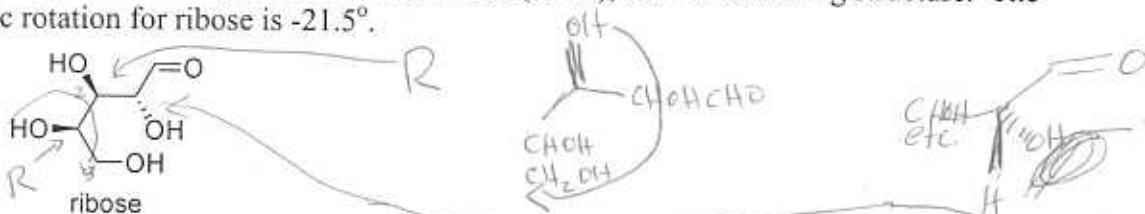
2.5 pts
 Step



4. Predict the major product(s) for each of the following reactions, showing stereochemistry where appropriate. (4 points each)

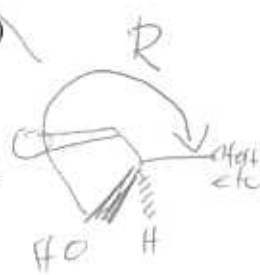


5. Ribose, an essential part of ribonucleic acid (RNA), has the following structure. The specific rotation for ribose is -21.5° .

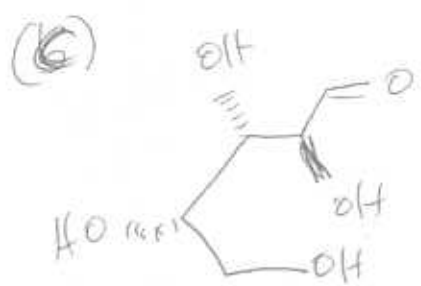
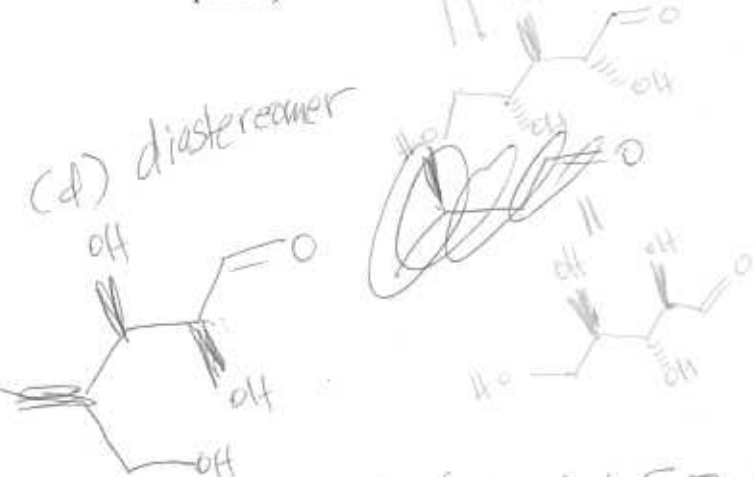


RRR

- Assign R or S configurations to each of the stereogenic centers in ribose. (6 points)
- How many stereoisomers of xylose are there? (2 points) $2^3 = 2 \cdot 2 \cdot 2 = 8$
- Draw the structure of the enantiomer of ribose. (4 points)
- Draw the structure of a diastereomer of ribose. (4 points)
- If possible, predict the specific rotation of the structures you drew for parts c and d. If it is not possible to predict one or both specific rotations, explain why briefly. (4 points)



(d) diastereomer



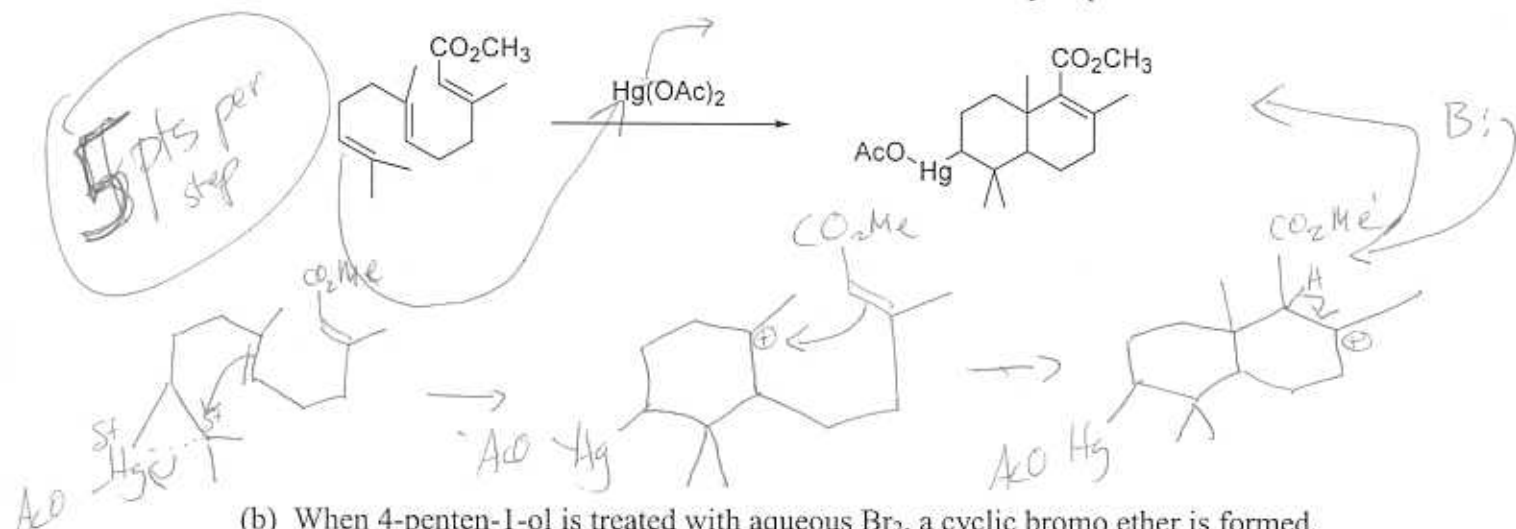
enantiomer

$[\alpha] = +21.5$

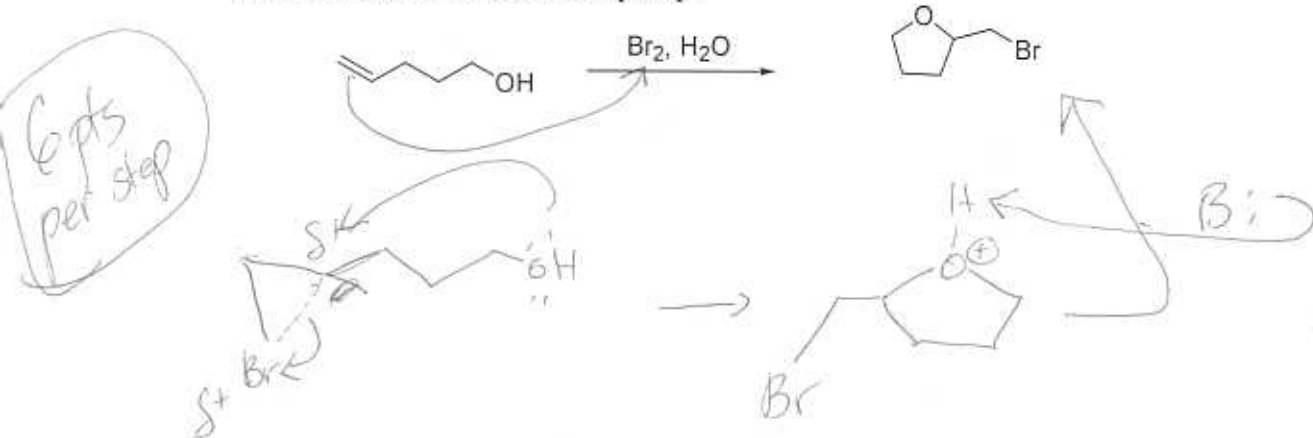
impossible to predict $[\alpha]$ b/c no relationship between properties of diastereomers

6. Choose **one** of the following two mechanism questions to complete. If you complete both problems, clearly mark which one should be graded **or the first one will be graded.**

(a) The following reaction takes place in high yield. Use your general knowledge of alkene chemistry to propose a mechanism even though you've never seen this reaction before. Use arrows to show the flow of electrons. Show every step.



(b) When 4-penten-1-ol is treated with aqueous Br₂, a cyclic bromo ether is formed, rather than the expected bromohydrin. Propose a mechanism, using arrows to show the flow of electrons. Show every step.



17
15
32
2
58