

**Chemistry 2301**  
**Professor Steven Kass**  
**Test 3**  
**November 10, 2004**

---

**(Please Print Your Name)**

**This exam consists of 9 pages (1-9) including this one. Please  
make sure that you have all 9 pages before you get started.**

## Points

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

4. \_\_\_\_\_

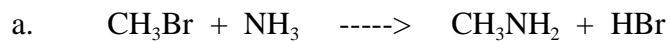
5. \_\_\_\_\_

6. \_\_\_\_\_

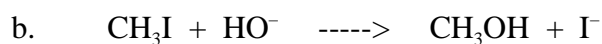
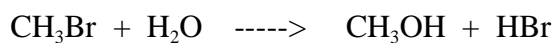
**Total:** \_\_\_\_\_

You have one hour to answer all of the following questions. Note the point values (110 total), be sure to budget your time, and **write all your answers below in ink**. Good luck!

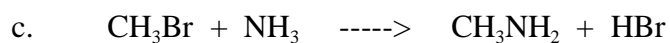
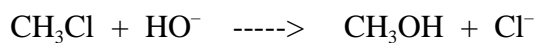
1 (20 Points). Consider the following pairs of reactions, indicate which transformation will occur more rapidly and briefly justify your answer.



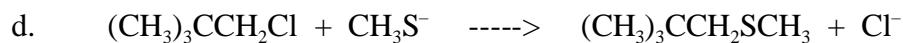
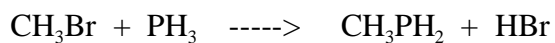
vs



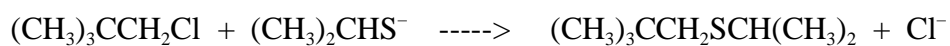
vs



vs



vs



2 (10 Points). The molecule below does not undergo substitution reactions regardless of the conditions employed. Explain why this is.



3 (20 Points). Radioactive iodide  $^{131}\text{I}^-$  is reacted with (S)-2-iodobutane ( $[\alpha] = +15.90^\circ$ ) until 10% of the iodobutane contains radioactive iodine. The observed rotation of the recovered iodobutane is found to be  $+12.72^\circ$ .

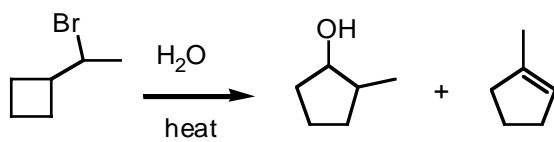
a. Determine the percentages of (R) and (S)-2-iodobutane in the product mixture.

b. What does this result indicate about the mechanism for the incorporation of radioactive iodide into (S)-2-iodobutane?

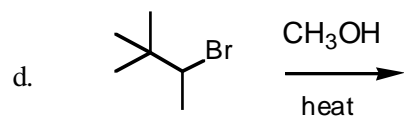
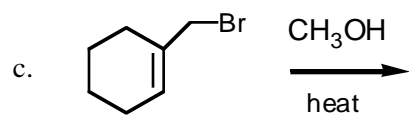
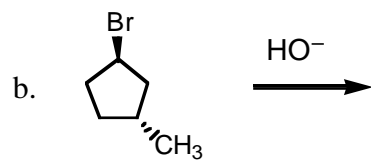
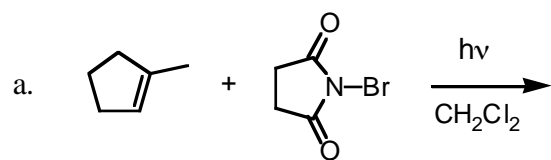
c. If (S)-2-butanol is reacted with KOH, no racemization is observed. Briefly account for this result.

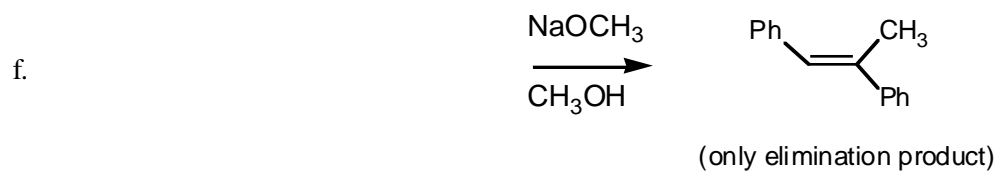
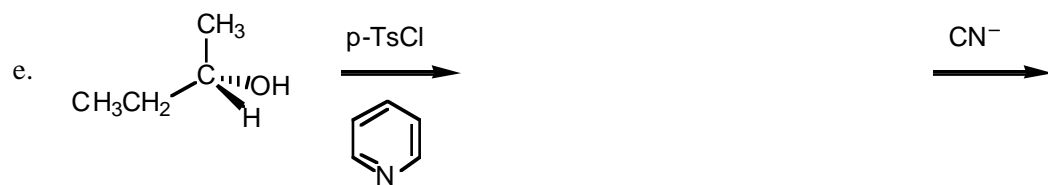
d. When (S)-2-butanol is reacted with dilute acid, racemization is observed. Briefly account for this observation.

4 (20 Points). Consider the reaction shown below and give a detailed step by step mechanism which accounts for the formation of the two indicated products.



5 (30 Points). Provide the missing information (reactant or product(s)) for the reactions shown below.





6 (10 Points). Starting with cyclohexane, show how to synthesize cyclohexyl methyl ether using any additional reagents via a sequence of chemical reactions (i.e. show reactants, reagents and products of reactions). Hint - what transformations do you know for alkanes?

