

Seat No. \_\_\_\_\_

LAST NAME \_\_\_\_\_

Section     A    

FIRST NAME \_\_\_\_\_

There are 8 pages to this exam. Check to make sure you have a complete exam.

PLEASE ALSO PRINT YOUR NAME ON THE TOP OF  
THE **BACK** OF THE LAST PAGE OF THE EXAM

**CHEMISTRY 331**

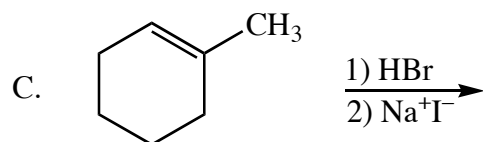
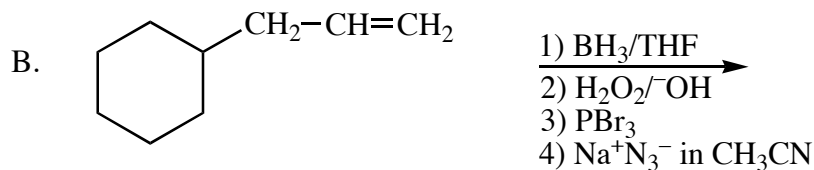
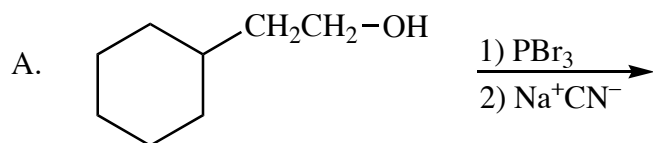
**EXAM IV**

Fall 2006 November 7, 2006

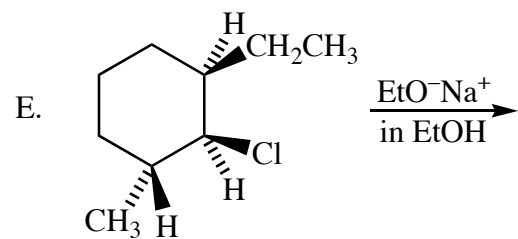
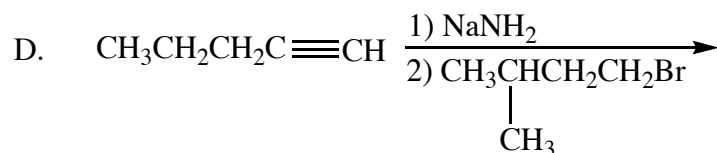
- I. (21 points) \_\_\_\_\_
- II. (12 points) \_\_\_\_\_
- III. (18 points) \_\_\_\_\_
- IV. (16 points)   \_\_\_\_\_  
A (8 pts) B,C (8 pts)
- V. (18 points)   \_\_\_\_\_  
A (9 pts) B (9 pts)
- VI. (15 points)   \_\_\_\_\_  
A (7 pts) B (8 pts)
- TOTAL (100 points) \_\_\_\_\_

THE FINAL EXAM IS SCHEDULED FOR WEDNESDAY, DEC. 13, FROM 7:00-9:00 P.M. ANY STUDENT WITH 3 EXAMS ON DEC. 13 SHOULD E-MAIL THE CHEM 331 INSTRUCTOR BEFORE NOV. 17 WITH THE LIST OF COURSE CONFLICTS.

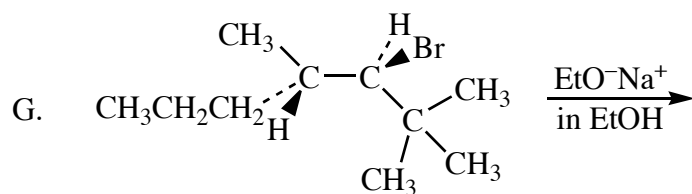
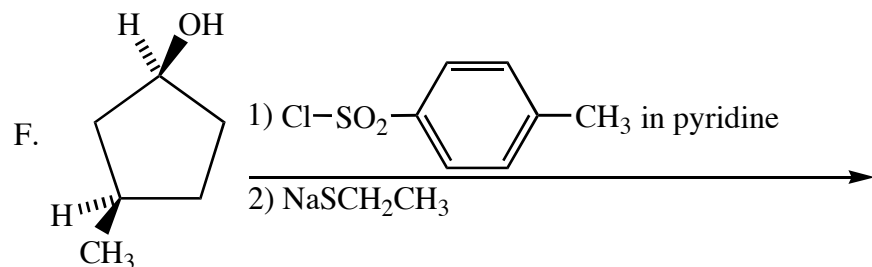
I. (21 pts) Complete the following equations giving all organic product(s). Stereochemistry must be clearly indicated in reactions which are stereoselective.



[no  $\text{sp}^2$  carbon atoms in product(s)]

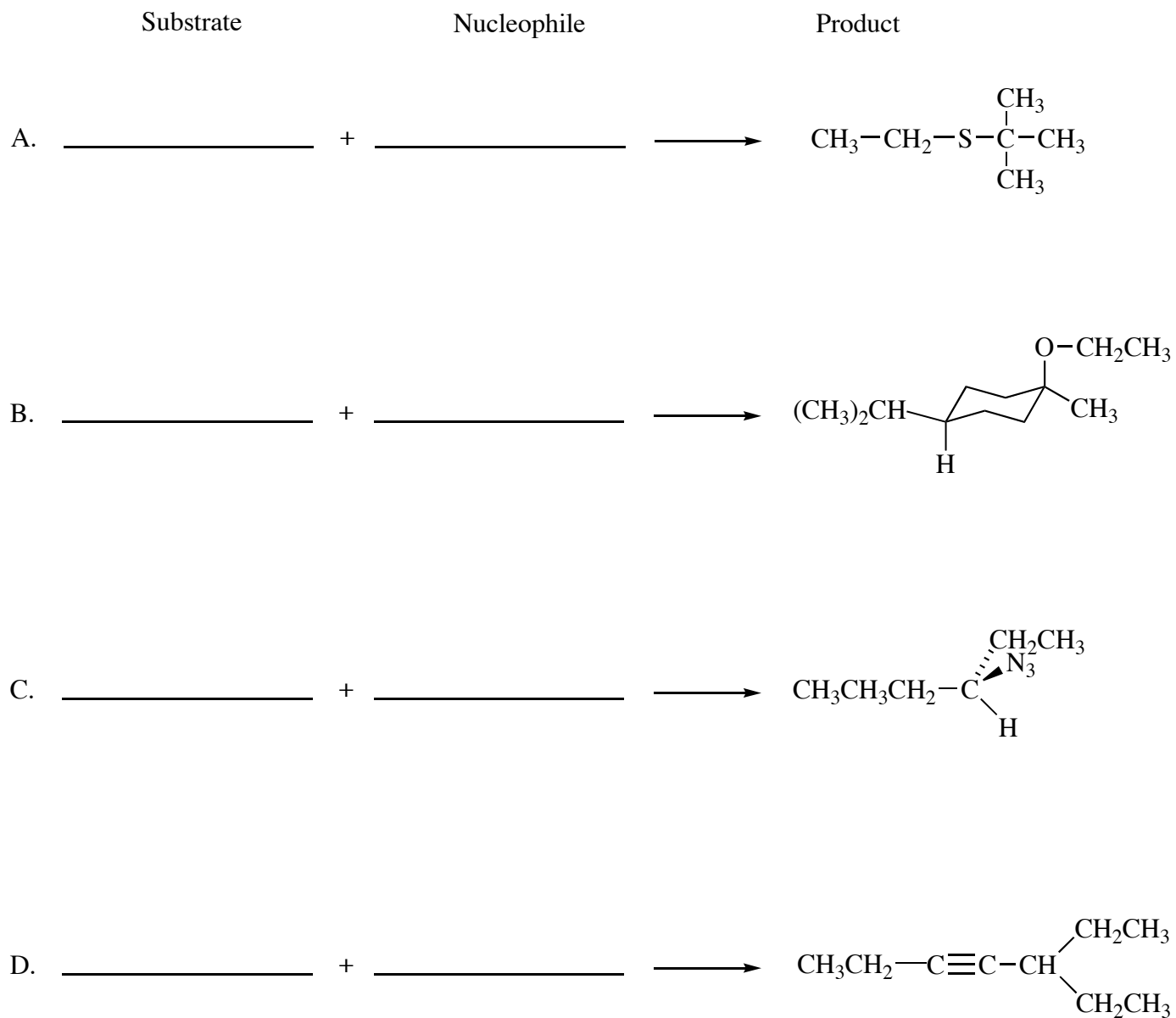


[no O in product(s)]



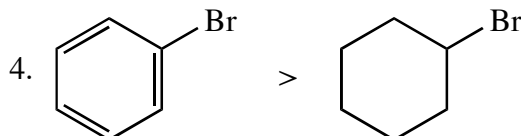
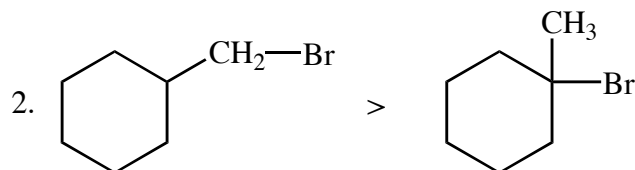
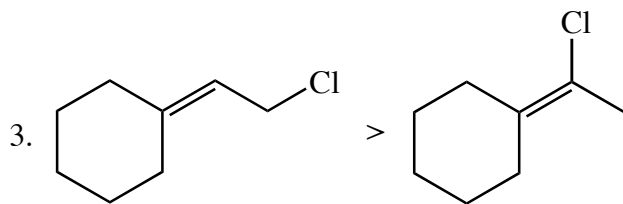
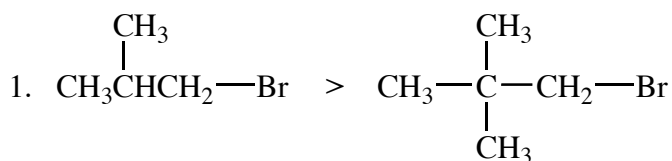
[only one product; no O in product]

II. (12 pts) Prepare the following compounds by an  $S_N2$  reaction by choosing a satisfactory substrate and nucleophile for each reaction (stereochemistry must be clearly indicated when necessary).

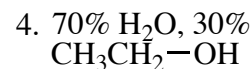
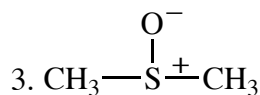
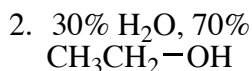
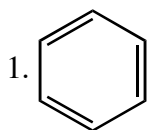


III. (18 pts) Circle the best answer.

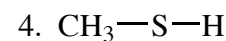
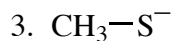
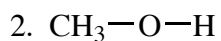
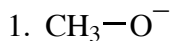
A. Which is **NOT** true for  $S_N2$  relative reactivities?



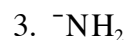
B. The reaction of  $\text{CH}_3\text{CH}_2\text{—S}^-\text{Na}^+$  with  $\text{CH}_3\text{CH}_2\text{—Br}$  is expected to be fastest in which of the following solvents?



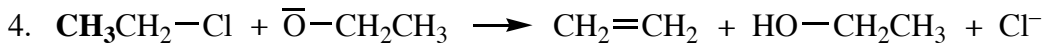
C. Which of the following is the best nucleophile in an  $S_N2$  reaction?



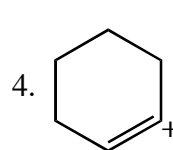
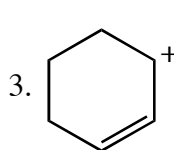
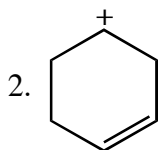
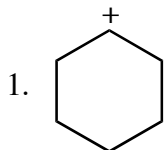
D. Which of the following is the best leaving group in an  $S_N2$  reaction?



E. Which of the following reactions shows the largest deuterium isotope effect when the bold hydrogens are replaced with deuterium?



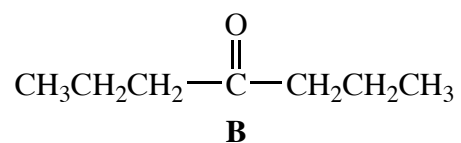
F. Which of the following carbocations is most stable?



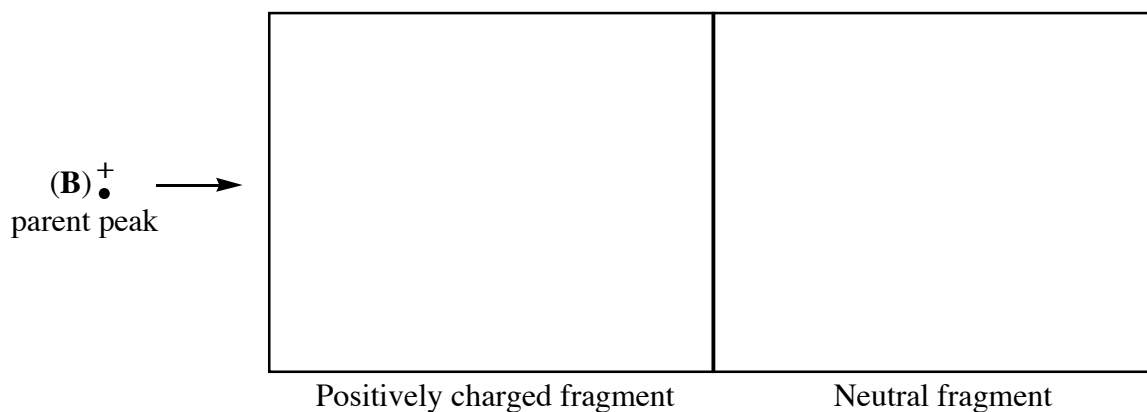




- B. (9 pts) The mass spectrum of ketone **B** (molecular formula is  $C_7H_{14}O$ ) shows a parent peak and one very strong fragmentation peak at a lower  $m/z$  values.

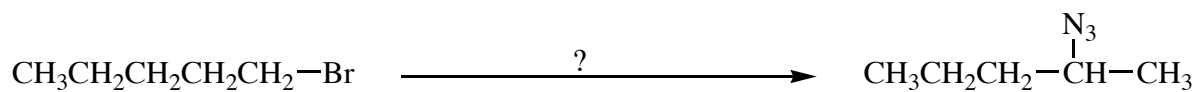


- (3 pts) What is the  $m/z$  value for the parent peak? \_\_\_\_\_
- (6 pts) The fragmentation of the parent peak gives a positively charged fragment and a neutral fragment. In the boxes provided give the expected structures of these species for the major fragmentation.



- VI. (15 pts) Beginning with the starting material indicated, show how to achieve each of the following syntheses by showing all the reactions that are needed (for each reaction, give the starting material, conditions over the arrow, and the products). You may use any inorganic compound or organic compound with 2 carbons or fewer.

A. (7 pts)



B. (8 pts)

