Chemistry 2521
Spring 2005; Sample Midterm 3 Exam (Chapters 7, 8, 9)

This exam has 5 problems on 5 pages. Make sure your copy is complete and correct.

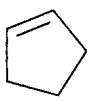
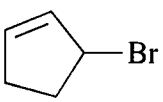
Printed Name (Last, First) Key

Scores:

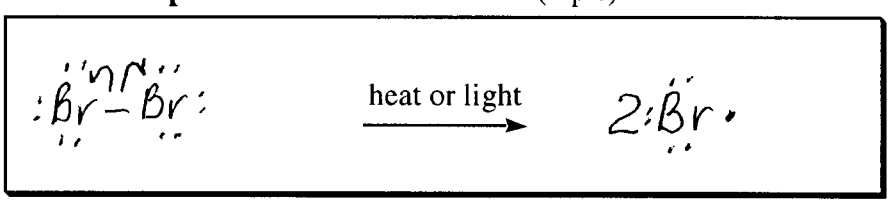
1. 18
2. 7
3. 30
4. 25
5. 20

Total: 100

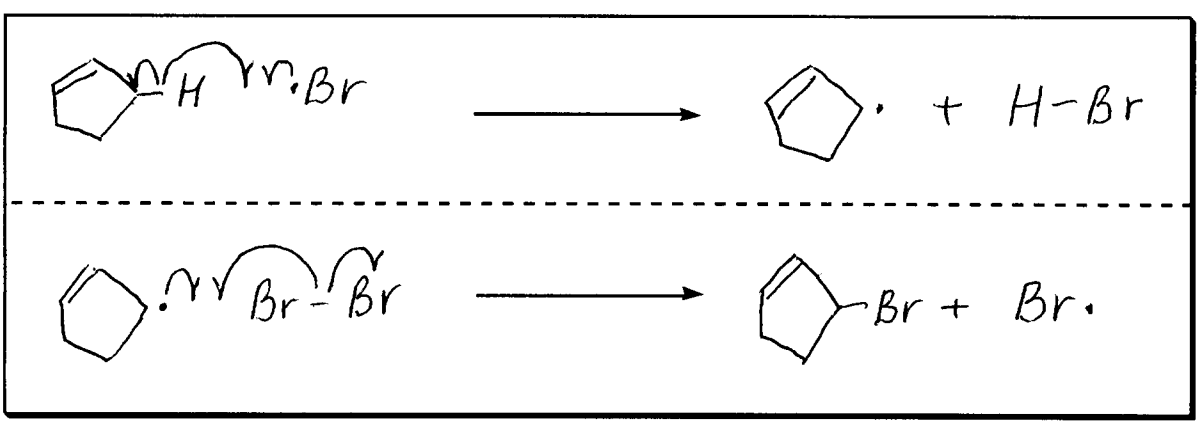
1. (18) Using provided boxes, answer the questions on **mechanisms** of the following reactions:

(a) (8 pts)  + Br_2 —heat or light→ 

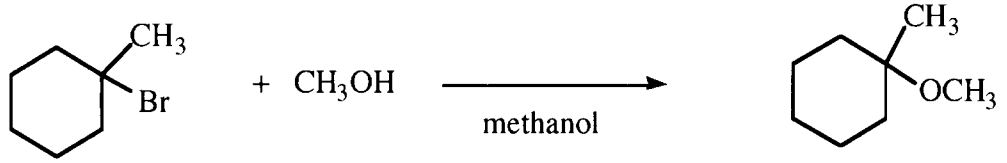
Using the "fishhook" arrows and showing the missing reagents, write the **initiation step** in the reaction mechanism (2 pts):



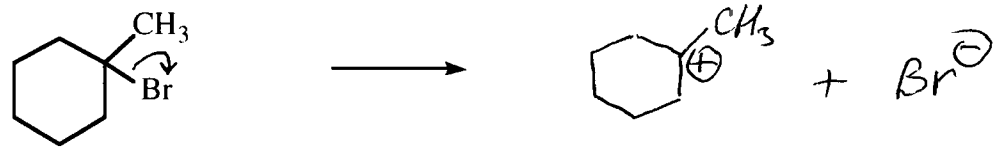
Using the "fishhook" arrows and showing the structure of the intermediates, write the two **chain propagation** steps in the reaction mechanism (6 pts):



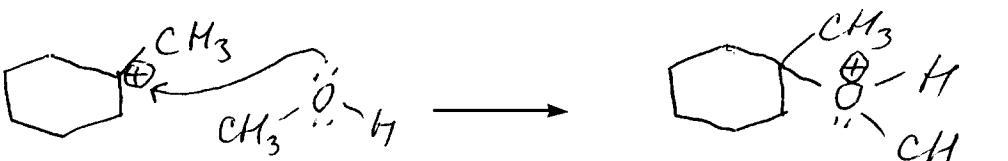
(b) (10 pts)



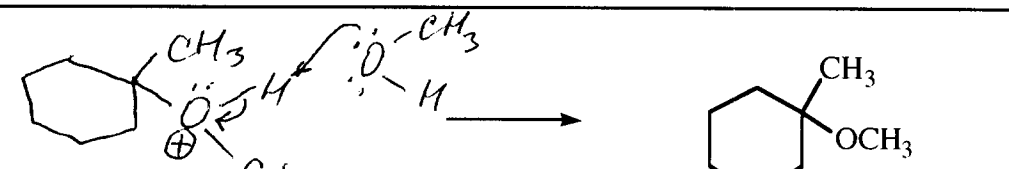
Using curved arrows (2 pts) and showing the structure of the carbocationic intermediate (2 pts), write the **first step** in the reaction mechanism:



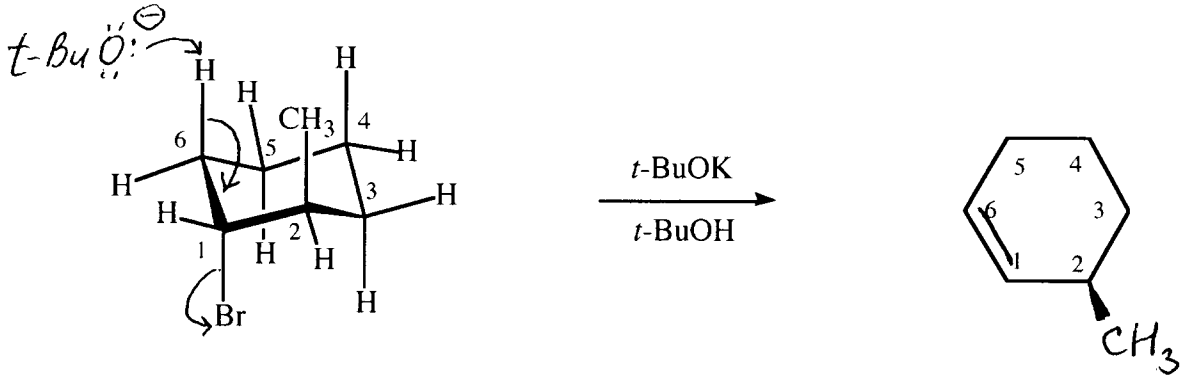
Using curved arrows, other essential reagents (2 pts), and showing the structure of the oxonium ion intermediate (2 pts), write the **second step** in the reaction mechanism:



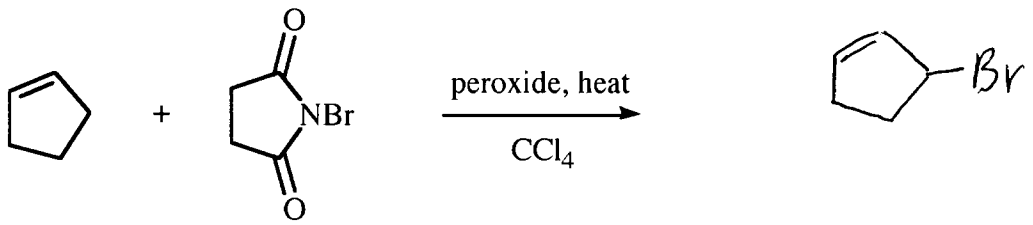
Using curved arrows and other essential reagents (2 pts), write the **final step** in the reaction mechanism:

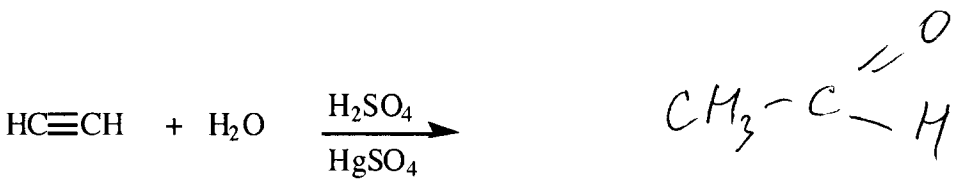


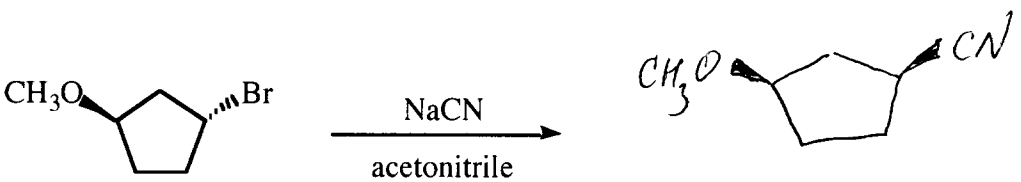
2. (7) Using the provided six-membered ring, draw the structure of the major product expected from the following **E2** reaction (3 pts). Use **curved arrows** to explain the mechanism of this reaction (4 pts).

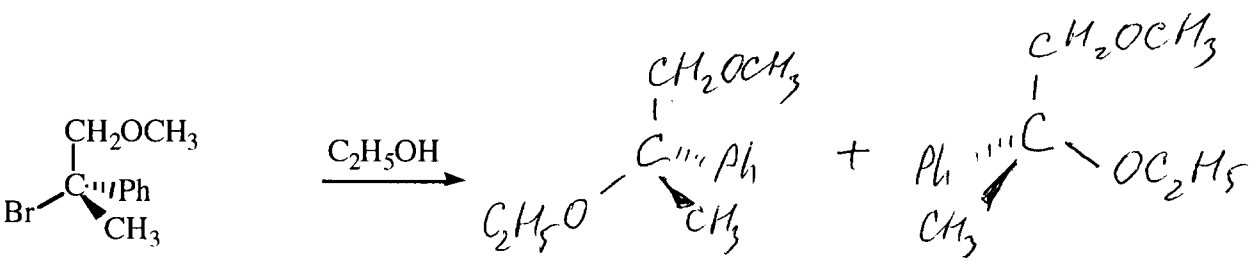


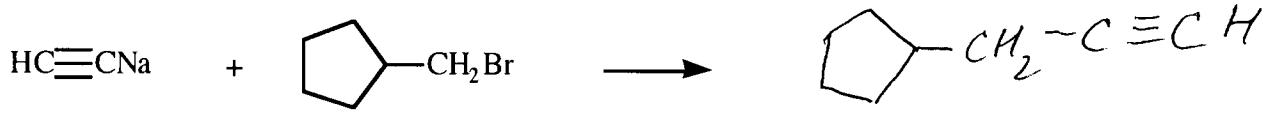
3. (30; 5 pts each) Complete the following equations, showing the **stereochemistry** of the product(s) when appropriate.

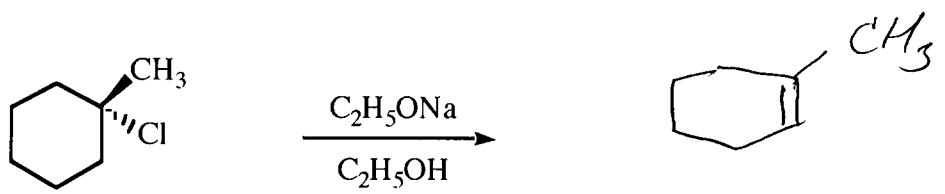




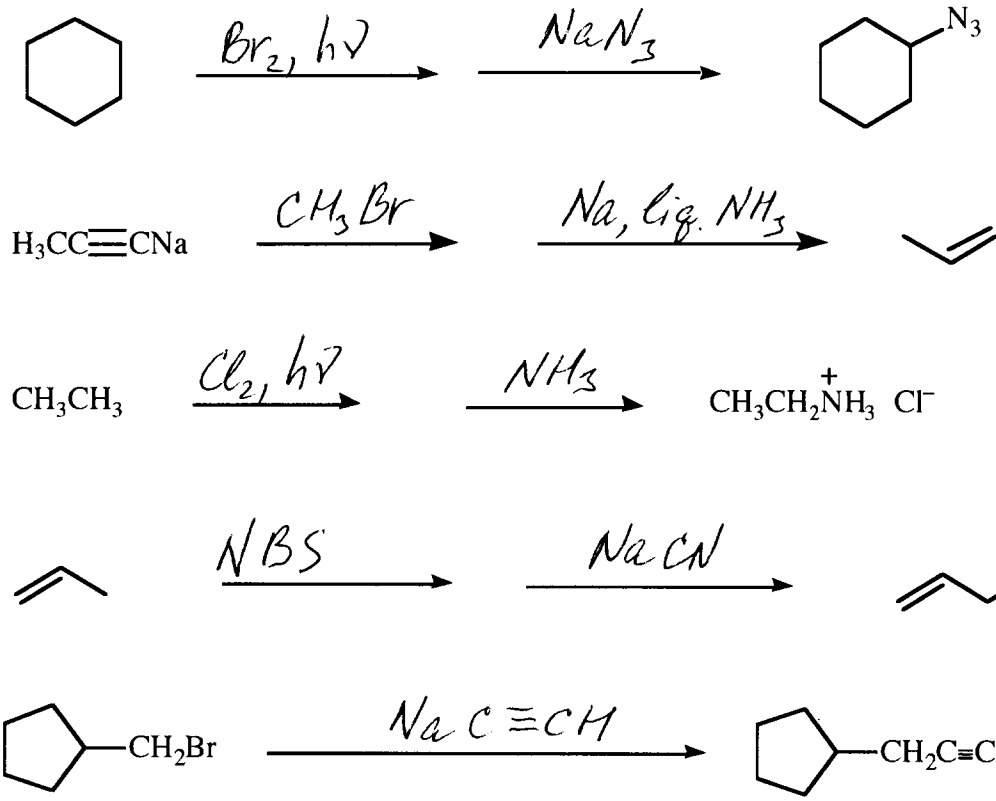








4. (25, 5 pts each) Give the **reagents on the arrow** that can be used to convert the reactant to the indicated product in high yield.



5. (20, 5 pts each) For each of the following questions (a)-(d) **circle** the item that is the correct answer.

(a) Which of the following compounds is the most **reactive** in an S_N2 reaction?

4-iodocyclohexene methane 2-iodohexane 3-iodohexane fluorocyclohexane
1-iodohexane 1-iodo-2-phenylhexane 1-iodo-4-methylcyclohexane methyl iodide

(b) Which one of the following compounds has the **best leaving group**?

cyclohexanol 3-methylcyclohexanol 1-methylcyclohexanol 1-phenylcyclohexyl chloride
methyl tosylate chloroform fluorocyclohexane 2-iodocyclohexanol ethanol

(c) Which of the following compounds is the **strongest nucleophile** in **polar aprotic** solvents?

CH_3OCH_3 KI CH_3OH NaCl NaF H_2O NaBr C_2H_5OH NH_3 CH_3NH_2

(d) Which one of the following reagents is the best choice for an **E2** reaction?

H_2O *t*-BuCl KI C_2H_5ONa NaN_3 $C_2H_5OCH_3$ NaI HI HCl *t*-BuOH KBr