

CHEM 3311-100

Exam 3, November 18, 2010

Time: 2 Hours

By printing my name below, I pledge that

“On my honor, as a University of Colorado-Boulder student, I have neither given nor received unauthorized assistance on this work.”

Your Name (**PRINTED IN CAPITAL LETTERS**)

Last Name

First Name

Middle Initial

Your CU Student ID # (**NOT** Your Social Security Number)

Your Recitation TA's Name

Last Name

First Name [-1 if missing or incorrect]

Circle Your Recitation Day & Time [-1 if missing or incorrect]

- | | | | |
|-------------------|--------------------|---------------------|---------------------|
| Mon 8 AM (Denman) | Tues 8 AM (Denman) | Wed 8 AM (Denman) | Thurs 8 AM (Manion) |
| Mon 2 PM (Moran) | Tues 5 PM (Manion) | Wed 8AM (Hartwig) | |
| Mon 5 PM (Denman) | | Wed 11 AM (Denman) | |
| | | Wed 12 PM (Hartwig) | |
| | | Wed 5 PM (Denman) | |

Grading Details

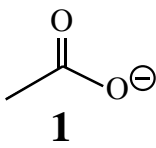
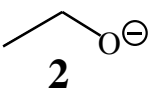
Page # (Question #s)	Points Possible	Points Earned
2 (Q 1&2)	22	_____
3 (Q 3)	12	_____
4 (Q 4)	20	_____
5 (Q 5)	16	_____
6 (Q 6)	20	_____
7 (Q 7)	10	_____
	TOTAL SCORE (out of 100)	_____

General Instructions

- (1) This is a CLOSED BOOK exam; nothing is allowed except a few pencils or pens, eraser, and student ID.
- (2) Please WRITE LEGIBLY & CLEARLY; minimize erasing! Untidy/illegible work will NOT be graded.
- (3) Print your name after acknowledging the student honor code. Write your name on each exam page in the space provided.
- (4) Use the back of the exam pages as scratch paper, if necessary.
- (5) If suspected of or caught cheating, you will receive at best an F for the exam. The instructor reserves the right to proceed further in compliance with university policies on academic violations.
- (6) You may not leave the room after the exam has started. Please leave quietly after you submit your exam to the TA or instructor.

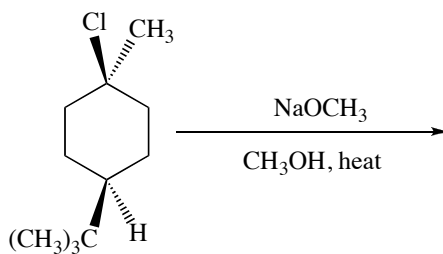
Question 1 (14 points)

For each pair of species shown below, indicate which is the stronger base and which is the better (more effective) nucleophile. The solvent is indicated below each pair. Each blank box should have a 1 or 2 written inside.

			Stronger Base	Better Nucleophile	
(A)	 1	or	 2	<input type="checkbox"/>	<input type="checkbox"/>
	in ethanol				
(B)	$\text{CH}_3\text{S}^\ominus$ 1	or	$\text{CH}_3\text{O}^\ominus$ 2	<input type="checkbox"/>	<input type="checkbox"/>
	in acetone				
(C)	F^\ominus 1	or	I^\ominus 2	<input type="checkbox"/>	<input type="checkbox"/>
	in water				
(D)	NH_2^\ominus 1	or	NH_3 2	<input type="checkbox"/>	<input type="checkbox"/>
	in water				

Question 2 (8 points)

Draw (in the box on the left) the most stable chair conformation of the alkyl halide in the reaction shown below. Draw the structure of the major product in the box on the right.



Structure of the MAJOR product



Circle the mechanism for this reaction:

E1

E2

S_N1S_N2

Question 3 (12 points)Multiple Choice: **Circle only the best answer possible.**

(I) Which alkyl bromide reacts fastest with NaCN in DMSO?

(A) CH₃Br(B) CH₃CH₂Br(C) (CH₃)₂CHBr(D) (CH₃)₃CBr(II) Which alkyl halide reacts fastest with NaSCH₃ in CH₃OH?(A) CH₃F(B) CH₃Cl(C) CH₃Br(D) CH₃I(III) In which solvent will CH₃CH₂I react fastest with NaF?(A) CH₃OH(B) HCO₂H

(C) DMSO

(D) C₂H₅OH

(IV) Which base yields the maximum amount of the E2 product when reacted with 1-bromo-4-methylpentane?

(A) NaOH

(B) NaOCH₃(C) NaOCH₂CH₃(D) NaOC(CH₃)₃

(V) Starting with 1-hexene, which synthetic sequence yields 2-cyano-hexane?

(A) Reaction with H₂SO₄ (cat.), H₂O; followed by reaction with NaCN

(B) Reaction with HBr; followed by reaction with NaCN

(C) Reaction with HBr in the presence of ROOR; followed by reaction with NaCN

(D) Reaction with Br₂ in water; followed by reaction with NaCN

Question 4 (20 points)

Circle the **alkyl halide** that reacts faster in each reaction under the specified conditions. Label the **faster reaction** as $S_N1/E1$, S_N2 , or $E2$ in the small box on the right. To receive partial credit, draw the structure of each alkyl halide in the appropriate box.

(A) 1-Bromobutane or 1-iodobutane with NaCN in DMSO?



(B) 1-Chloro-2-methylbutane or 1-chloropentane with NaI in acetone?

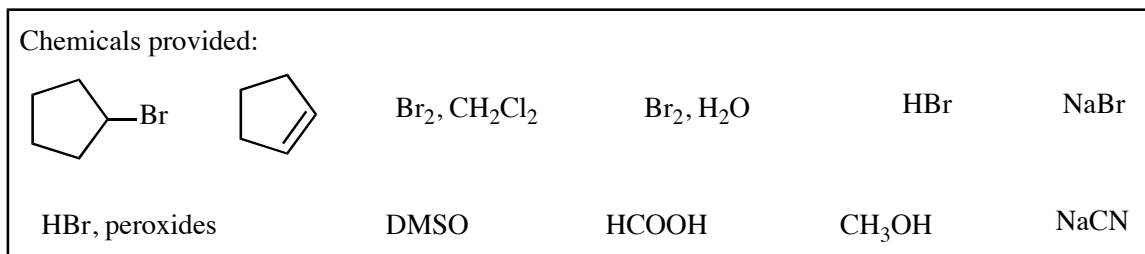
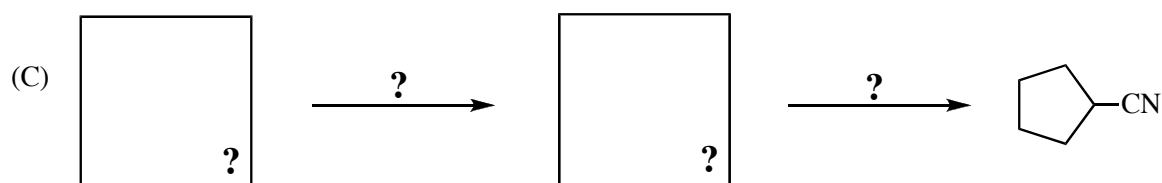
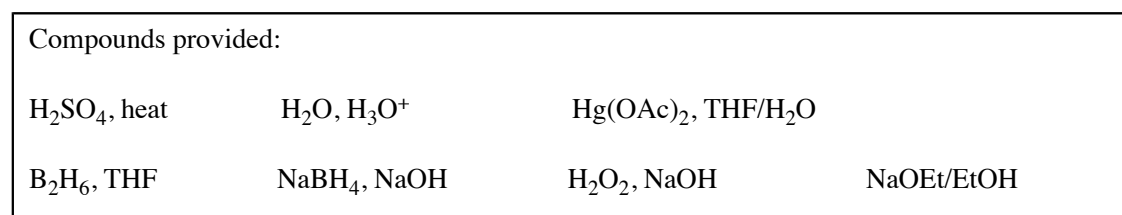
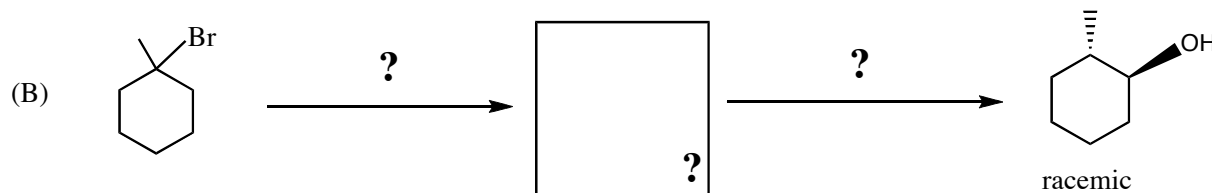
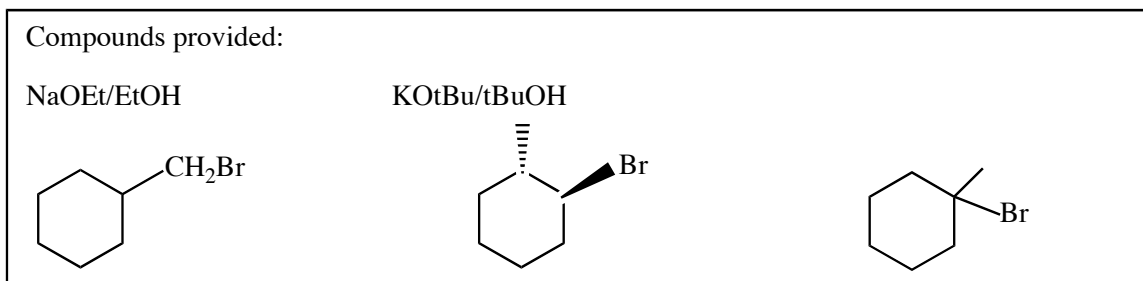
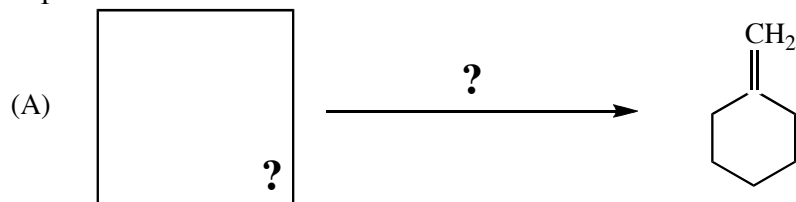
(C) Hexyl chloride or cyclohexyl chloride with NaN_3 in aqueous ethanol?

(D) Solvolysis of 1-bromo-2,2-dimethylpropane or *tert*-butyl bromide in ethanol?

(E) Solvolysis of isobutyl bromide or *sec*-butyl bromide in aqueous formic acid?

Question 5 (16 points)

Complete each transformation by **filling in the correct reagents or major product of that particular step** (indicated by question marks "?") using ONLY the reactants/reagents/solvents listed in the appropriate section. Your synthesis must lead to the highest yield possible in each step.



Question 6 (20 points)

Complete each reaction by filling in the reactant, reagent and/or solvent, or **major product** as necessary. Wherever relevant, show appropriate stereochemistry using dashes and wedges.

