

CHEM 3311, Professor Zhang, Spring 2010
Third hour exam, April 15, 2010

Printed Name: _____ Student ID: _____

Scores:

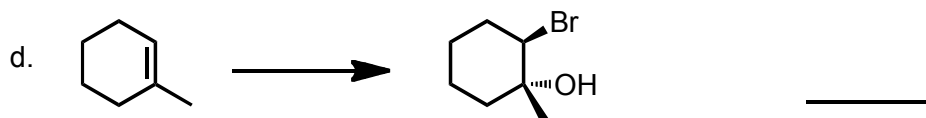
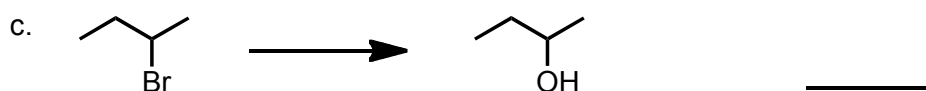
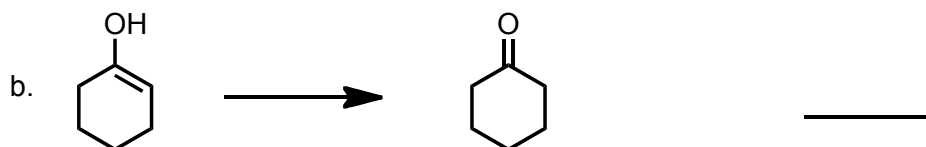
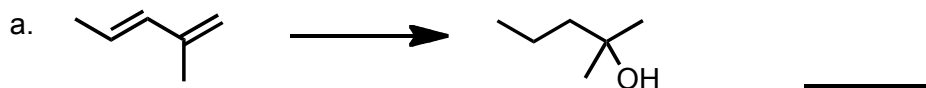
- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)

This is a closed-book exam. The use of notes, models, calculators, scratch paper will not be allowed during the exam. Please put all your answers on the test. Use the backs of the pages for scratch.

Partial Periodic Table

1A							8A
1 H						2 He	
	2A	3A	4A	5A	6A	7A	
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
						35 Br	
						53 I	

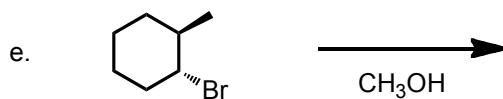
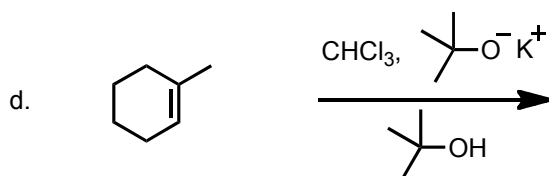
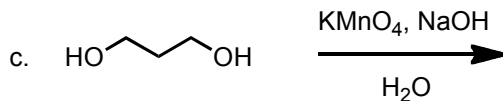
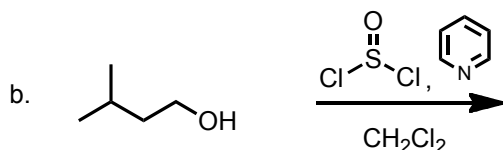
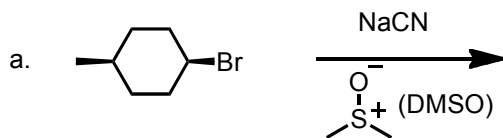
1. (12 pts) Indicate the following transformations are oxidations [O], reductions [H] or neither [N].



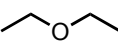
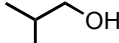
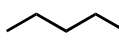
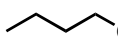




2. (12 pts) For each of the following pairs of compounds, indicate which is the stronger base, and which is the stronger nucleophile. The solvent is indicated below the structures. Each box should have a 1 or a 2 written inside.

			Stronger Base	Stronger Nucleophile
a.	$\text{F}_3\text{C}-\text{CH}_2-\text{O}^-$ 1 in ethanol	$\text{CH}_3-\text{CH}_2-\text{O}^-$ 2	<input type="text"/>	<input type="text"/>
b.	I^- 1 in water	F^- 2	<input type="text"/>	<input type="text"/>
c.	$\text{CH}_3(\text{CH}_2)_3-\text{O}^-$ 1 in <i>n</i> -butyl alcohol	$(\text{CH}_3)_3\text{C}-\text{O}^-$ 2 in <i>t</i> -butyl alcohol	<input type="text"/>	<input type="text"/>

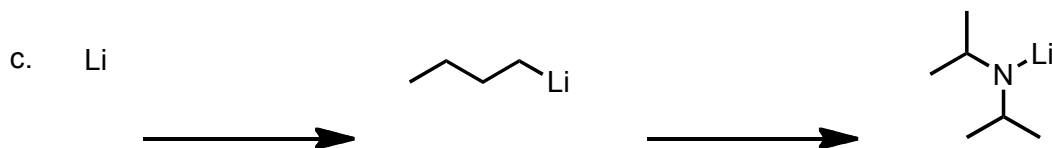
3. (15 pts) Draw the single major product of each of the following reactions, showing stereochemistry using wedges and dashes. If a racemate is formed, show only one enantiomer of the product, and label it "rac". All the reagents are shown above the reactions arrows and the solvents are shown under the arrows.



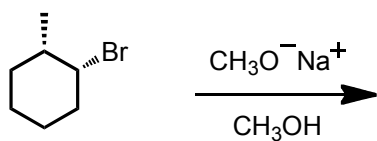
4. (12 pts) For the following Group A compounds, indicate which has the highest or lowest boiling point (B.P.); for Group B compounds, indicate which has the highest or lowest solubility in water. Each box should have a **number** written inside.

				Highest B.P.	Lowest B.P.	
A.					<input type="text"/>	<input type="text"/>
	1	2	3	4		
				Highest solubility in H ₂ O	Lowest solubility in H ₂ O	
B.					<input type="text"/>	<input type="text"/>
	1	2	3	4		

5. (16pts) Propose reagents for accomplishing each of the following reactions. Make your reactions efficient (i.e. the target product should be the major product). Assume chiral starting materials and products are single pure enantiomers unless they are labeled "rac".



6. (12 pts) a) When (1R, 2S) 1-bromo-2-methylcyclohexane is allowed to react with sodium methoxide in methanol, three products are formed in various amounts. One product is an ether, and two products are different alkenes. Give the structures of the **three products**, showing stereochemistry where appropriate, and **circle the major alkene product**.



b) Carefully draw a picture of the transition state leading to the major alkene product. Be sure to indicate the stereochemical structure (equatorial vs axial substituents) of the transition state and justify your answer with **one sentence**.

7. (21 pts) Propose a synthesis of each of the following targets, starting with any organic molecules containing five (5) carbons or less, and any necessary inorganic reagents. **For any unstable organic reagents (e.g. Grignard, radical, carbene) that you want to use, you should show their synthesis (how to prepare them)**. Try to make your synthesis efficient (i.e. the target should be produced in the highest possible yield). **More than one step may be required and you should draw all the intermediates**. HINT: Try to work backwards from the target to the smaller starting materials, using reactions you know.

