

EXAM 2
CHEMISTRY 220a
Friday, October 15, 2004

NAME (print): _____

TA:_____ Day:_____ Time:_____

Take a few moments to look over the exam. Answer each question on the exam paper.

Important clues, points, and structures are in **bold**.

Do all **preliminary** drawing or computations on the work sheets at the end of the exam. The work sheets will not be graded.

The exam is 55 minutes.

STOP writing and hand in your exam when you are asked to do so.

REMEMBER: Neatness is to your advantage.

1. Thermochemistry (28 pts) _____

2. Reactions (24 pts, Do 4 of 5) _____

3. Potpourri (24 pts, Do 4 of 5) _____

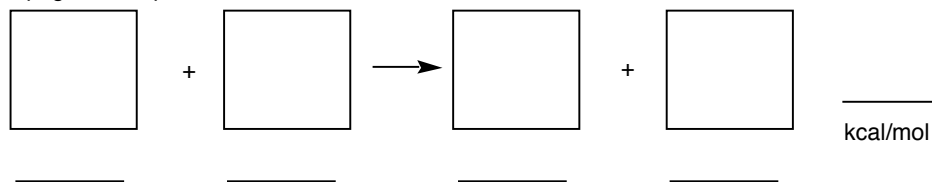
4. Mostly Mechanisms (24 pts, Do 4 of 5) _____

Total (100 pts)

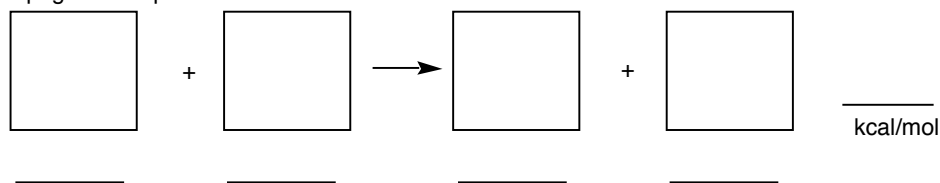
1. **Thermochemistry:** (28 pts.)

a) (18 pts) Provide the propagation steps and overall reaction for the gas phase, room temperature, free radical monobromination of **cycloheptane**. Place the alkane in the first box on the left. Place the other reactants and products in the remaining boxes with their BDEs on the appropriate lines. See the last page 11 for BDEs.

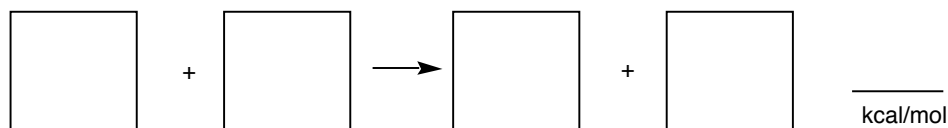
Propagation step 1



Propagation step 2

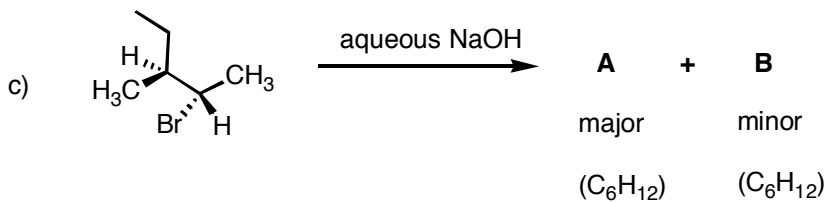
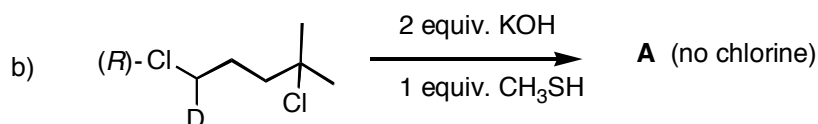
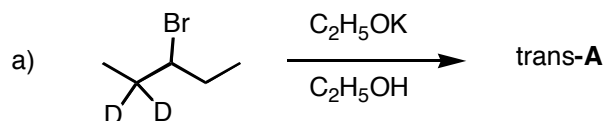


Overall reaction



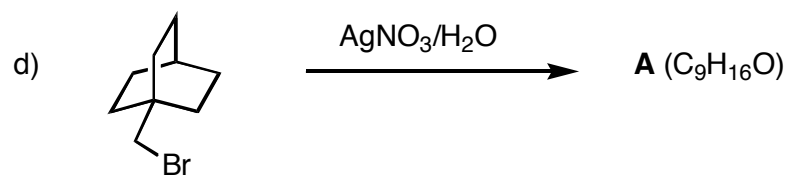
b) (10 pts) Determine the heat of formation of the monobromination product in part a), given the following data: ΔH_f° (kcal/mol): cycloheptane (-28.2), HBr (-8.7), Br₂ (+7.4), HCl (-22.1), and Cl₂ (0).

2. **Reactions:** (4 x 6 pts. = 24 pts.) Provide reasonable structures for the products in **4 of 5** of the following reactions. If you do all five, be sure to **cross out the one that you do not want graded**. Comment very briefly. Pay attention to stereochemistry and absolute (R vs. S) configuration.

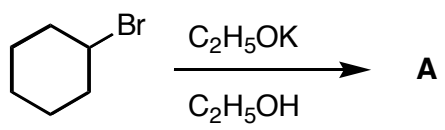


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2. Continued.

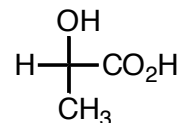
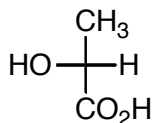
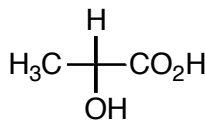
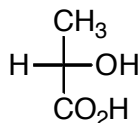
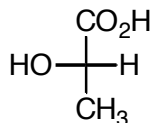


e) Alkyl halide 2 from ORGO.



3. **Potpourri:** (4 x 6 pts. = 24 pts.) **Do 4 of 5.** If you do all five, be sure to **cross out the one that you do not want graded.**

a) "One of these things (Fischer projections) is not like the others. One of these things doesn't belong." **Circle** it.



b) A 3/2 mixture of enantiomers has an observed $[\alpha] = +16^\circ$. What is the **best answer** for the rotation of the major enantiomer? **Circle** it. **Show** work.

-80°

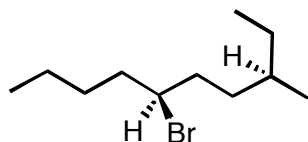
$+16^\circ$

78°

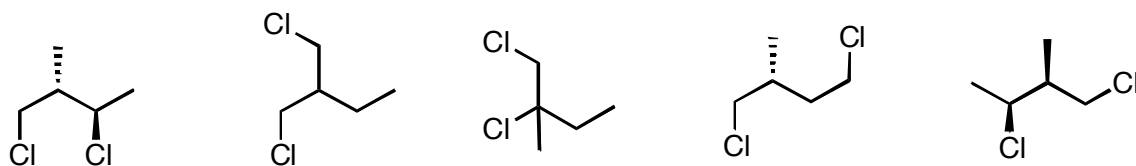
$+3^\circ$

0°

c) Name the following optically active by IUPAC rules.

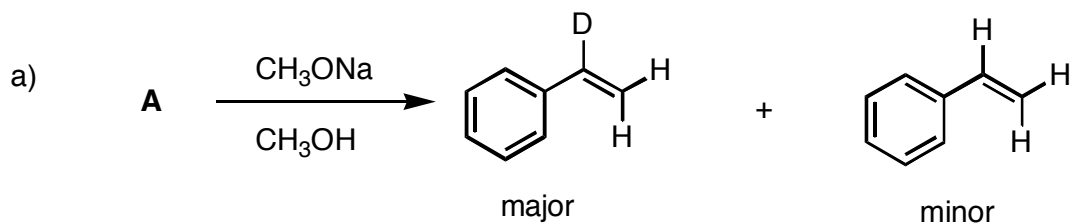


d) Free radical chlorination of (*R*)-1-chloro-2-methylbutane leads to five constitutional isomers, one of which has a stereoisomer present (**A**), one of which is achiral (**B**), and one of which is a racemate (**C**). Label **A** and its stereoisomer **A'**, **B**, and, **C** below. [Note: **A** and **A'** are not distinguishable with the information provided.]

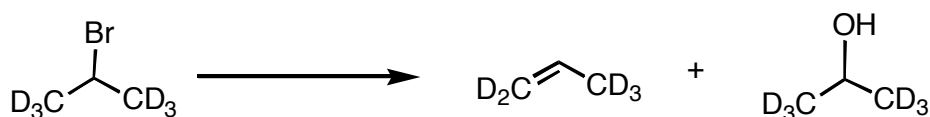


e) Why is the heat of formation of bromine given in **1b** equal to its heat of vaporization? Be brief.

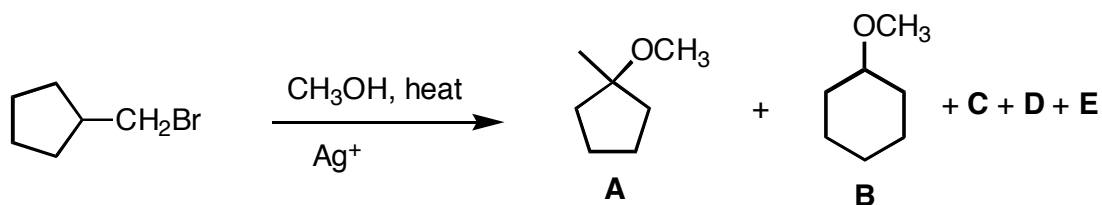
4. **Mostly Mechanisms:** (4 x 6 pts. = 24 pts.) Provide the structures or requested information in **4 of 5** of the following problems. **Comment** briefly. If you do all five, be sure to **cross out the one that you do not want graded**. [Note: Questions a-d are from the questions at the end of Chapters 5 and 6.]



- b) Provide reaction conditions so that the rate of formation of the products is no different from the reaction with protio 2-bromopropane.



- c) Provide a mechanism for the formation of **A** or **B**.

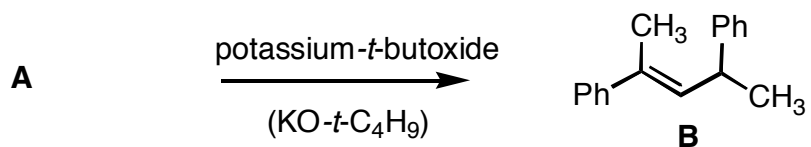


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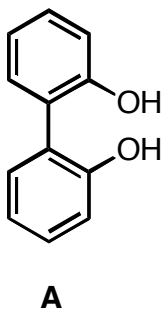
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4. Continued.

d) Provide the stereochemical structure of an alkylbromide **A** that leads only to **B**.



e) Compound **A** is not resolvable even though the two hydroxyl groups cannot pass one another. **Explain briefly.**



Name: _____

Work Sheets

Name: _____

10

Work Sheets

Name: _____

11

Work Sheets

Name: _____