NAME _____

UM Internet ID _____

ORGANIC CHEMISTRY I (2301-001)

9:05 – 9:55 am, April 7, 2008

Exam 3

You are allowed one 8-½" x 11" piece of paper, with any writing on it you like, as an aid for this test. Otherwise, you are not permitted to use any other materials (including notes, books, or electronic devices of any kind).

Please write your name at the top of this page now, and the next page when the exam begins.

You may use pen or pencil. However, re-grades will be considered only for exams completed in pen.

Please write your answers in the boxes/spaces provided. If your answer is not in the appropriate space (say, for example, it's on the back of the page), draw us an arrow and/or note telling us where to look.

NAME _____

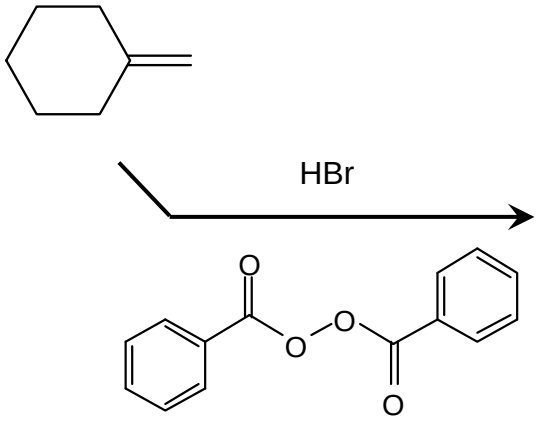
Scoring: 1. _____ / 24 4. _____ / 12

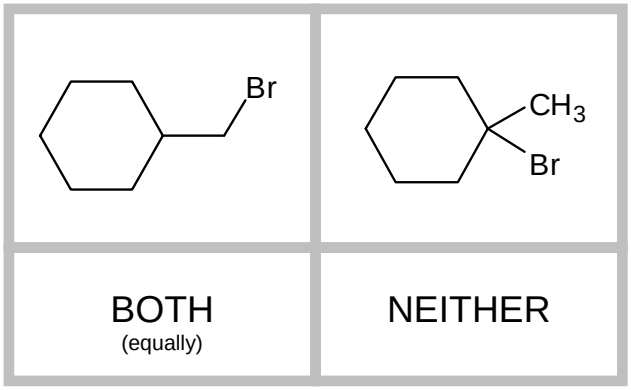
2. _____ / 20 5. _____ / 20

3. _____ / 24

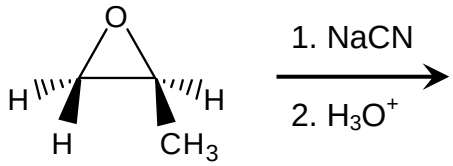
Total Score: _____ / 100

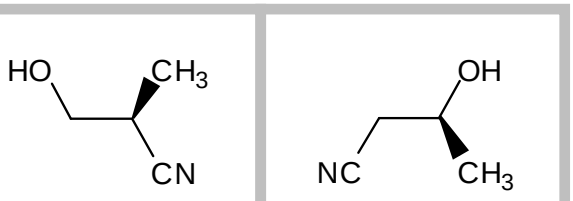
1. (24 pts) Each of the reactions below is drawn with two possible products. If one of the two products predominates, circle that preferred product. If the two products are produced equally, circle "BOTH". If neither product would result from the reaction, circle "NEITHER". **Circle one answer only.**





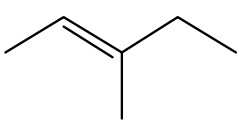
BOTH (equally)	NEITHER



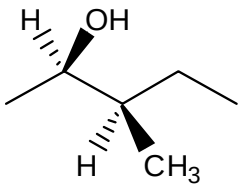


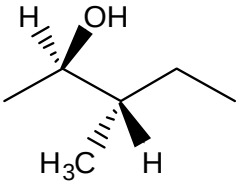
BOTH (equally)	NEITHER

(Problem 1 continues on the next page)

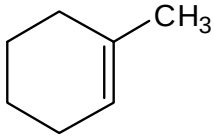


1. BH_3•THF
2. H_2O_2, OH^-





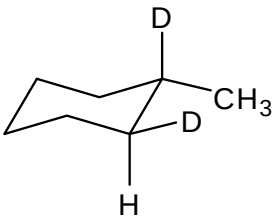
BOTH (equally)	NEITHER

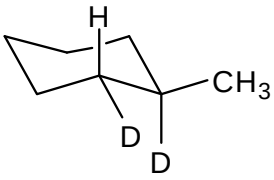


Pt

D_2

(D = deuterium, heavy isotope of hydrogen)

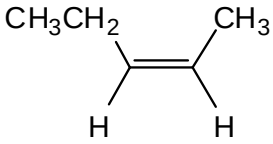




BOTH (equally)	NEITHER

$CH_3CH_2—C\equiv C—CH_3$

Na, NH_3



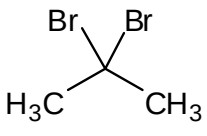
$CH_3CH_2CH_2CH_2CH_3$

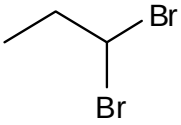
BOTH (equally)	NEITHER

$CH_3—C\equiv C—H$

HBr

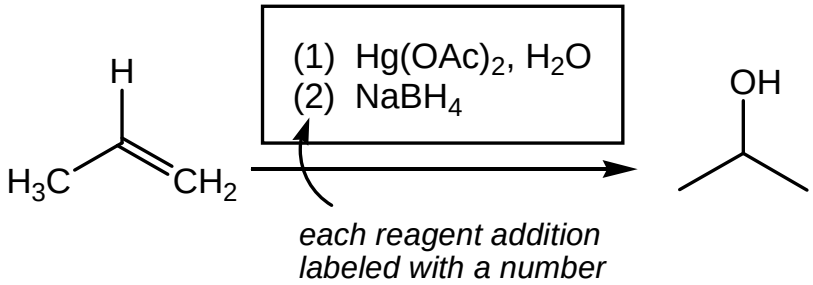
(excess)



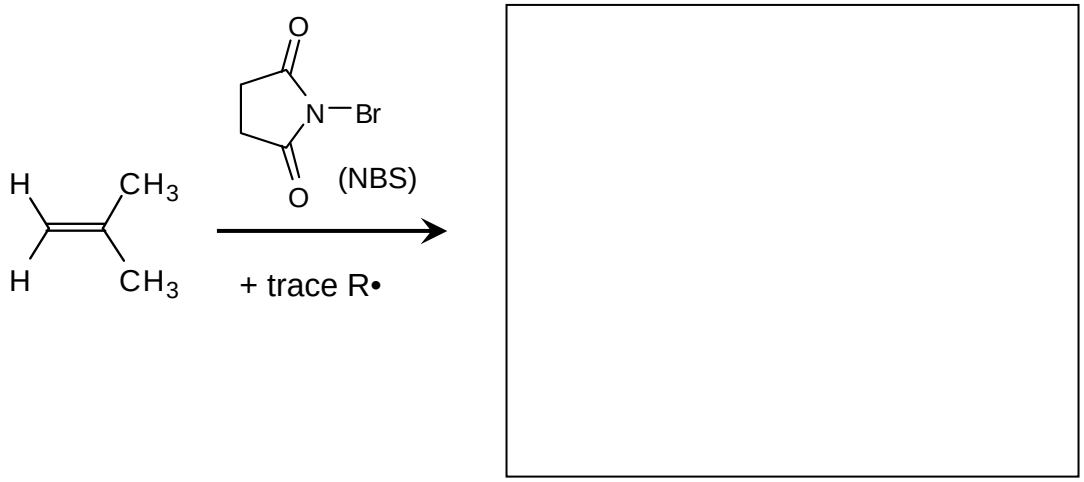


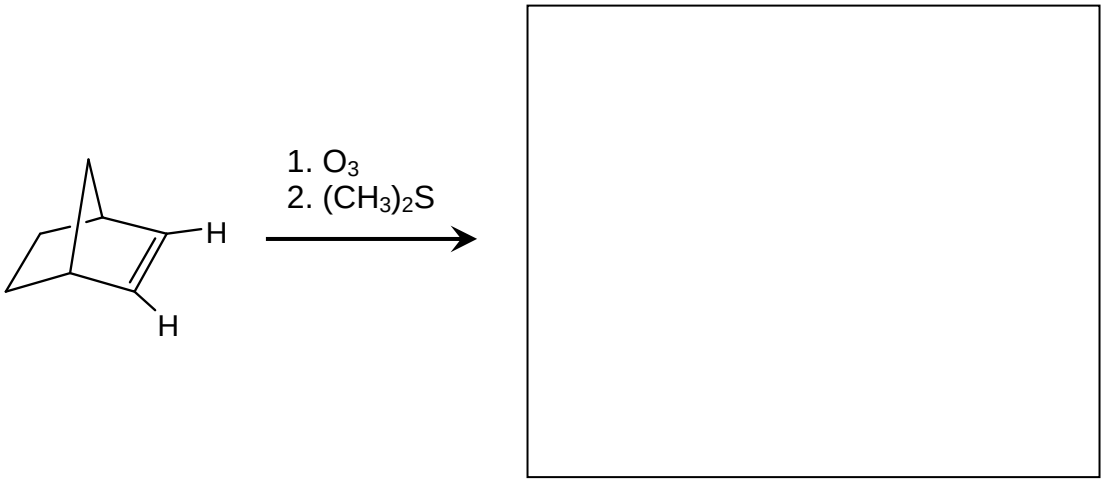
BOTH (equally)	NEITHER

2. (20 pts) For each of the reactions below, fill in the empty box corresponding to reactants, reagents or products. For reactions that require a sequence of multiple reagent additions, make sure each addition in your "recipe" is labeled with a number. For example:



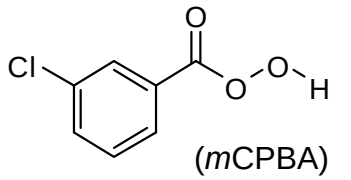
Give only one answer in each box. For reactions that you expect to yield multiple products, give the major product. For reactions that yield multiple enantiomers, draw only one enantiomer in the box, and include the note "+ enantiomer".



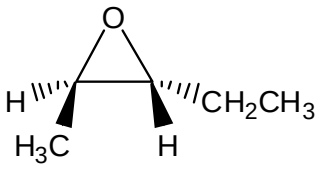


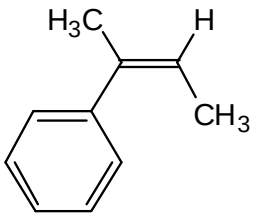
(Problem 2 continues on the next page)

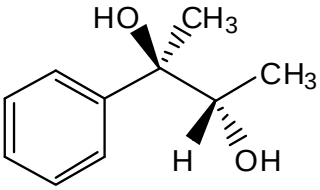
an alkene



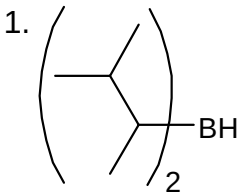
(*m*CPBA)



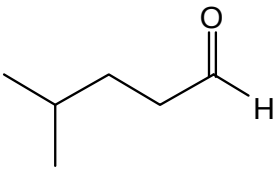




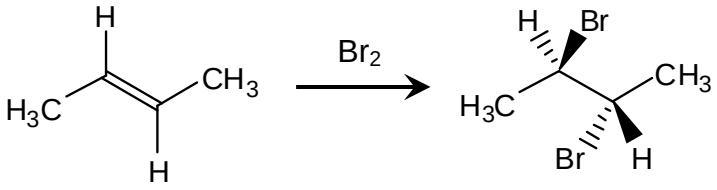
an alkyne



2. H_2O_2
NaOH

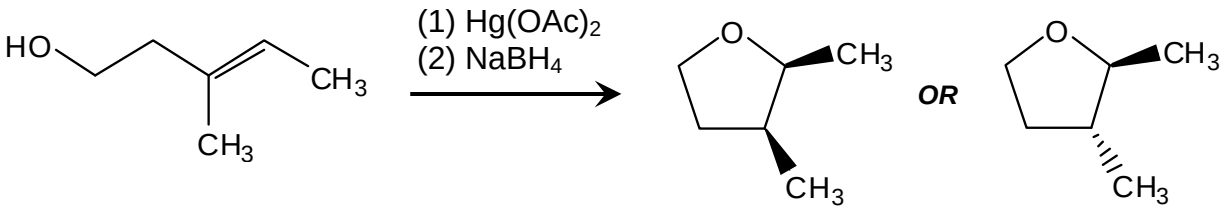


3. (24 pts) Draw a mechanism (using "electron pushing") for each of the reactions shown below. Draw each mechanistic step explicitly; don't cheat by combining multiple processes in a single step. Use only the molecules shown in the problem; don't invoke generic species. (E.g., don't use "H-A" as a generic acid.)



Mechanism:

(Problem 3 continues on the next page)

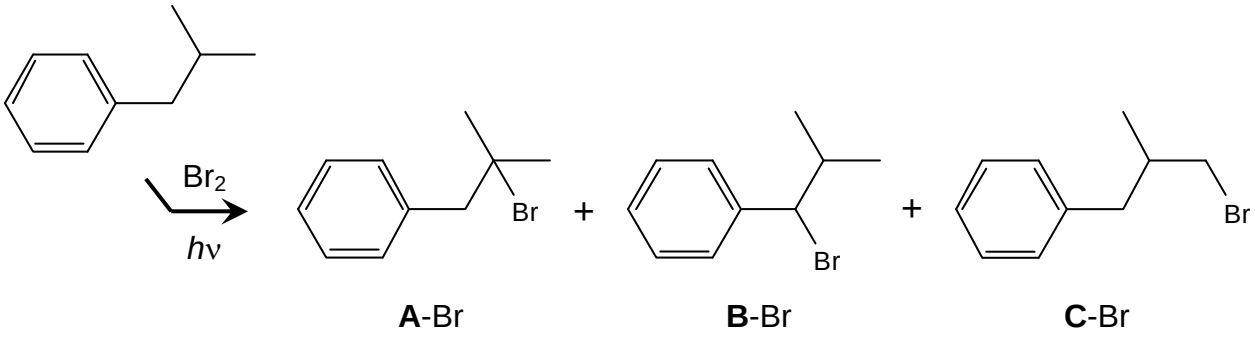


(+ enantiomer) *(+ enantiomer)*

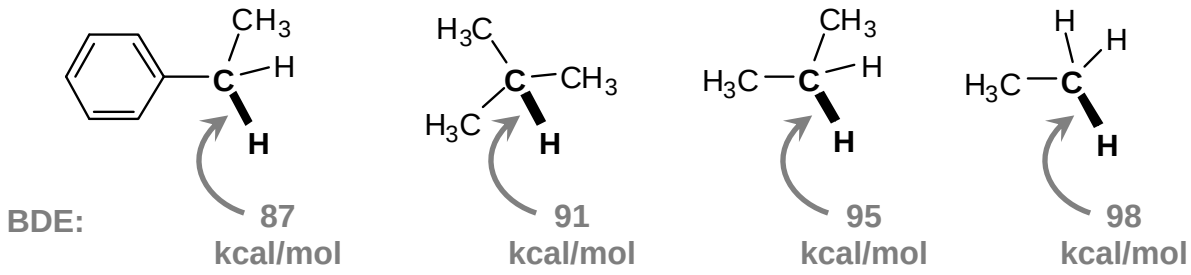
Which product diastereomer is made, selectively? (**Circle one** of the two products.)

*Mechanism of **(1) $Hg(OAc)_2$ only**:*
(Do not worry about (2) $NaBH_4$ step)

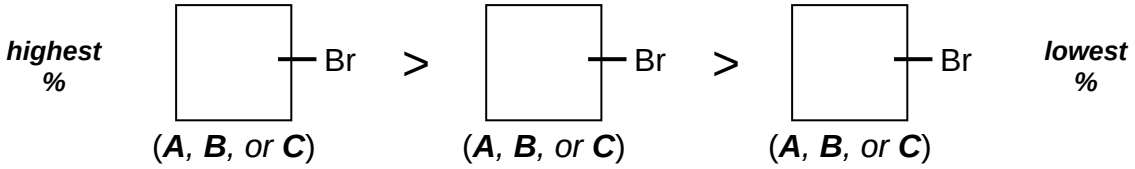
4. (12 pts) The starting material shown below reacts with bromine and light to generate three different monobrominated products.



The diagram below shows bond dissociation energies (BDEs) for C-H bonds similar to those that react in the starting material:



(a) Rank the three products in order of product ratio, from highest % produced to lowest.



(b) Would chlorination (using Cl_2 instead of Br_2, to yield **A**-Cl, **B**-Cl and **C**-Cl) generate the preferred product more selectively, less selectively, or with the same selectivity relative to bromination? (Circle one answer.)

Chlorination would be

MORE SELECTIVE **LESS SELECTIVE** **EQUALLY SELECTIVE**

for the preferred product, relative to bromination.

5. (20 pts) For the starting materials and product shown below, **propose a multistep synthesis**. In addition to the molecules shown, you can use any reagents and reactions we've learned about in class. You might discover multiple answers to this problem; draw only your best (one) synthetic route. Feel free to draw an incomplete route—we will give you partial credit where we can.