

CHEMISTRY 3311, Fall 2004
Professor Walba
Second Hour Exam, October 21

scores:

1) 20

2) 20

3) 20

4) 20

5) 20

100

CU Honor Code Pledge: On my honor, as a University of Colorado at Boulder Student, I have neither given nor received unauthorized assistance.

Name (printed): _____ Key

Signature: _____

Recitation TA Name: _____

Recitation day and time: _____

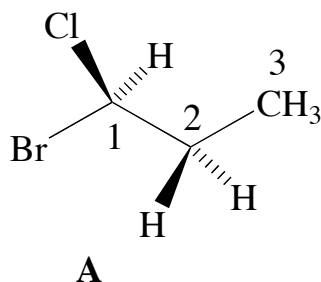
This is a closed-book exam. The use of notes, models, calculators, scratch paper, or any other paraphernalia will not be allowed during the exam. Please put all your answers on the test. Use the backs of the pages for scratch.

PLEASE read the questions carefully!

1A							8A	
1 H							2 He	
2A								
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		

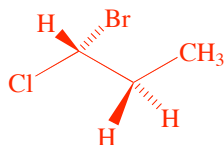
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1) (20 pts) A staggered conformation of 1-bromo-1-chloropropane is given in a wedges and dashes structure in structure **A**. In this conformation the bromine and C(3) methyl group are anti.



a) Give the chirality descriptor (R or S) for the center of chirality at C(1). **R**

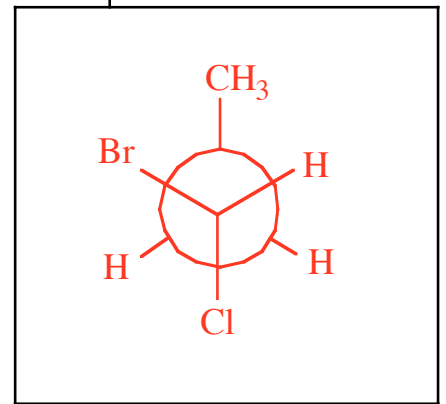
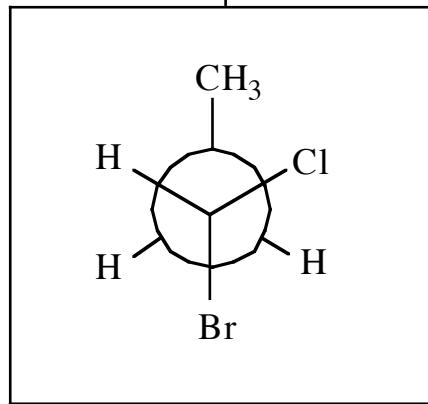
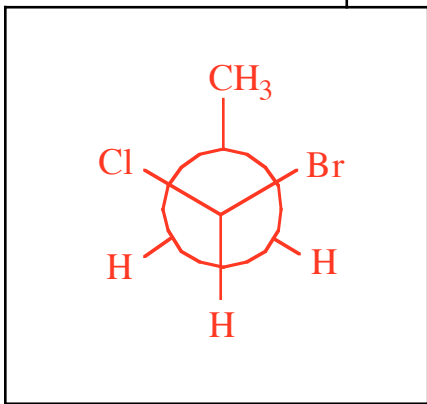
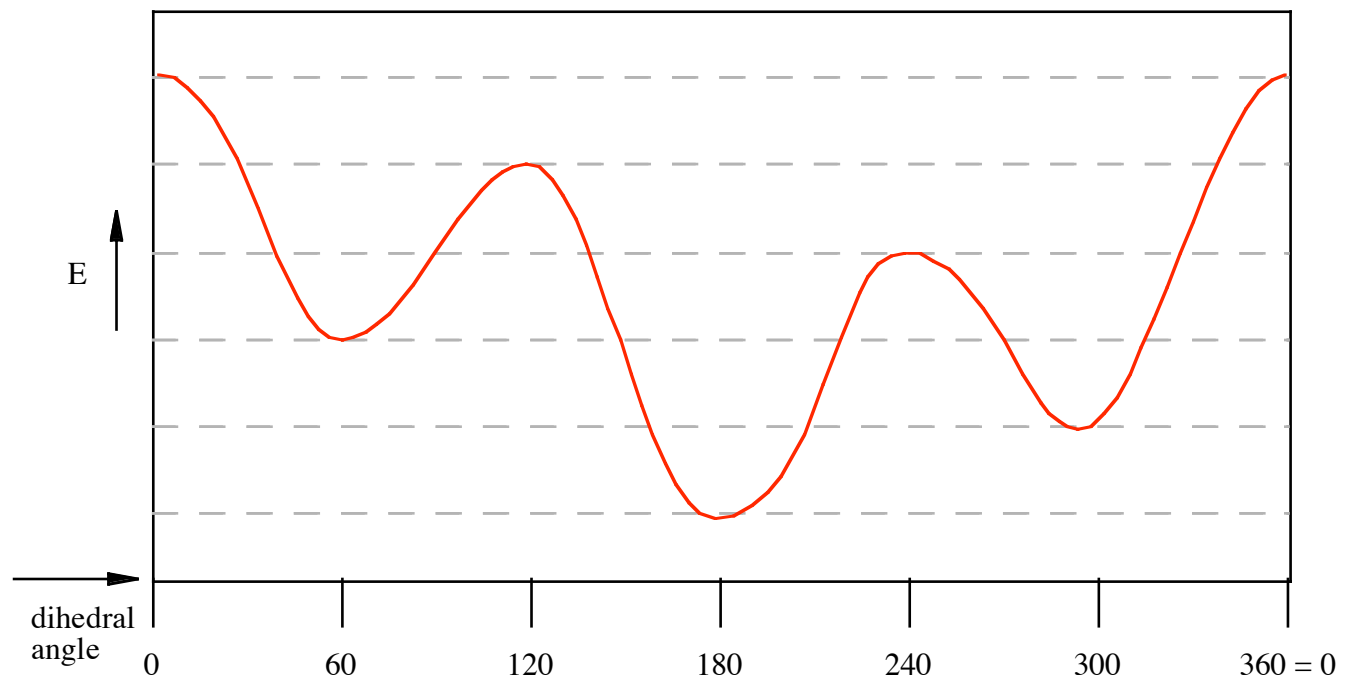
b) Draw a wedges and dashes structure of compound **A** in the conformation where the chlorine and C(3) methyl group are anti.



c) Complete the conformational energy diagram on the next page for rotation about the C(1)-C(2) bond of compound **A**. The dihedral angles are for the Br-C(1), and C(2)-C(3) bonds (the 180° dihedral conformation is given). Please rotate the FRONT carbon (C(1)), and rotate clockwise to get the 300° conformation. Be sure to carefully indicate the relative energy of each well and barrier in your energy diagram, and draw Newman projections for the 60° and 300° conformations. In order to solve this problem correctly, you need to know that bromine has almost the same size, sterically, as a methyl group, and that chlorine is smaller than bromine or methyl, but bigger than H.

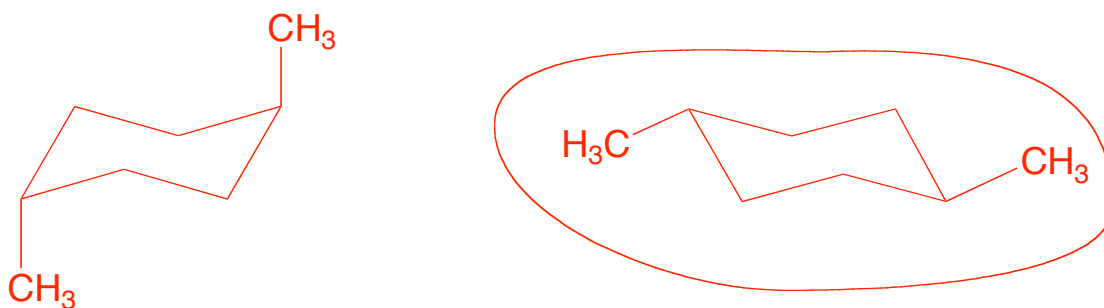
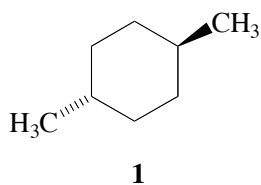
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1) – continued-

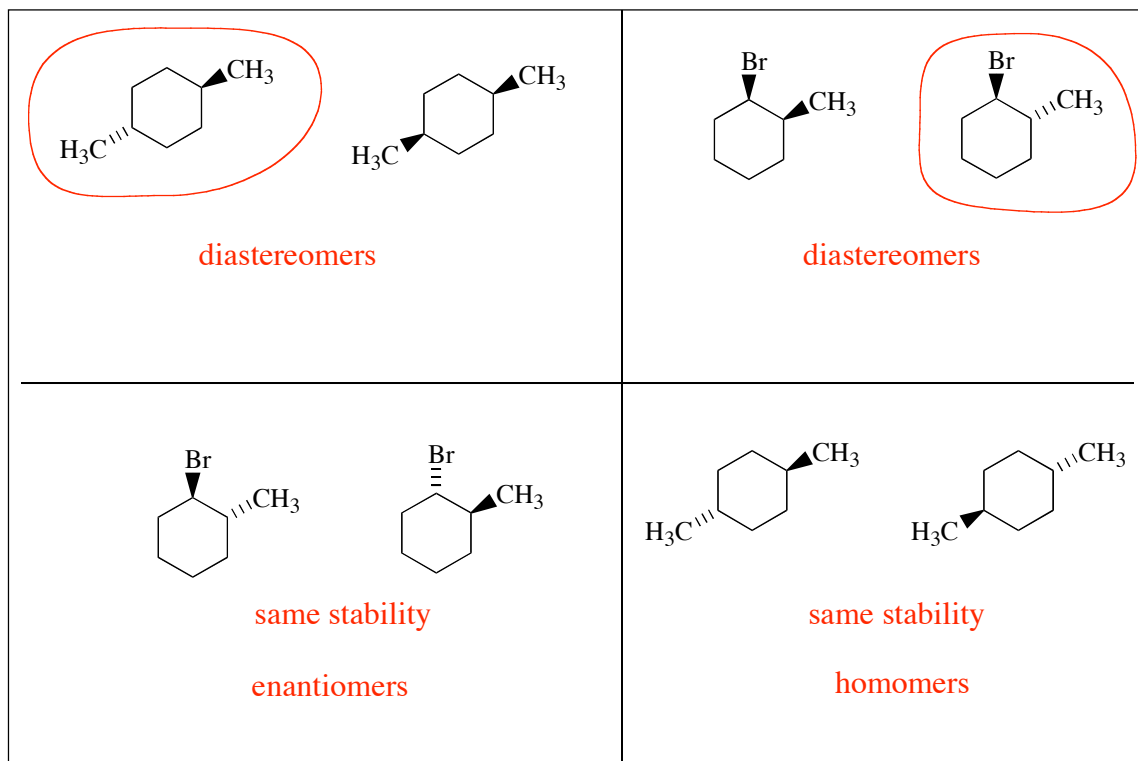


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2) (20 pts) a) Carefully draw the two flip-chair conformations of trans-1,4-dimethylcyclohexane (**1**) as perspective chair structures, and circle the more stable conformation (please do not show H atoms on the rings).

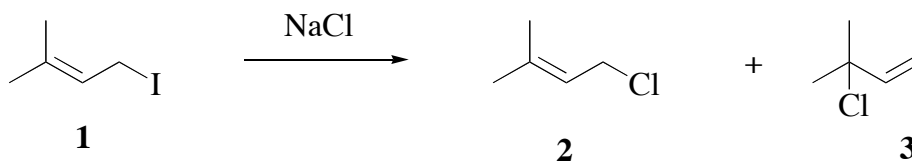


b) Describe the relationship between each of the following pairs of substituted cyclohexanes (i.e. homomers, enantiomers, or diastereomers). For each pair, indicate the more stable isomer by circling it, or write “same stability.” Bromine is still the same size as methyl.



Name: _____

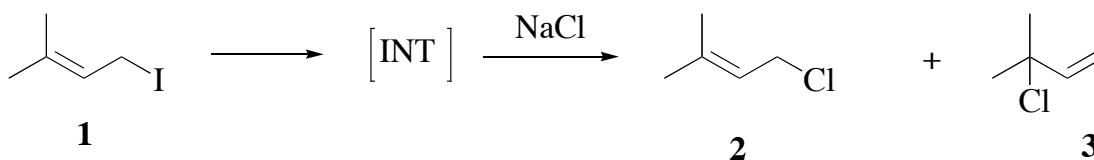
3) (20 pts) The allylic iodide **1** reacts with sodium chloride to give a mixture of chlorides **2** and **3**.



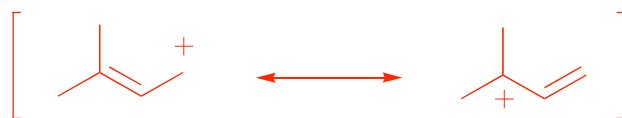
a) Is this reaction exothermic or endothermic? **Exothermic**

b) Experiments show that the rate of formation of products is independent of the concentration of sodium chloride, and depends only upon the concentration of the iodide **1**. What is the name of the mechanism of this reaction? **SN1**

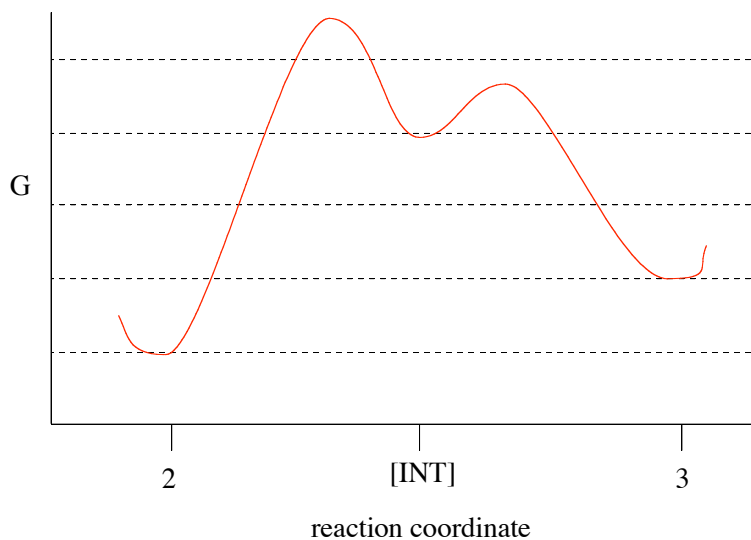
c) A reactive intermediate is involved in this transformation, as indicated below.



Write the two major resonance contributors to the structure of [INT].

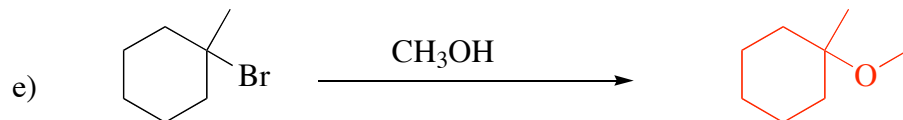
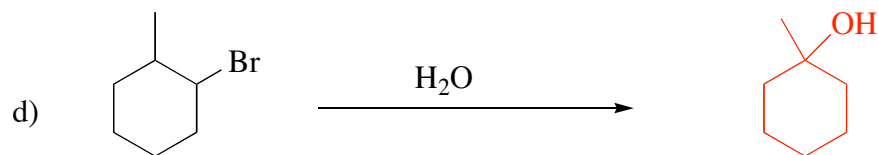
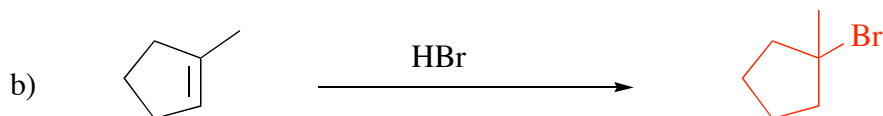
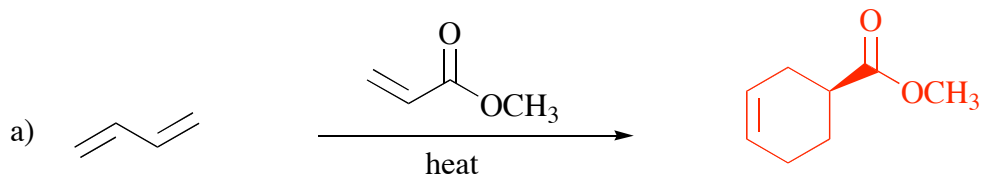


d) When this reaction is run at low temperature, formation of the products is irreversible, and the major product is chloride **3**. When the reaction is run at high temperature, formation of the products is reversible, and the major product is chloride **2**. Complete the energy diagram for formation of the products from the intermediate (note that the starting iodide **1** is left off this diagram to simplify the problem).



Name: _____

4) (20 pts) Give the single major product of each of the following reactions. If a racemate is formed, consider this to be one product, and draw only one enantiomer.



Name: _____

5) (20 pts) For each of the following reactions, give the single major product, carefully showing stereochemistry using wedges and dashes if appropriate, and propose an arrow-pushing mechanism for the transformation.

