CHEMISTRY 3311, Fall 2003
Professor Walba
First Hour Exam, September 25

scores:

1) 20

2) 20

3) 15

4) 20

5) 25

_____
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): _____

Signature: _____

Recitation TA Name: _____

Recitation day and time: _____

This is a closed-book exam. The use of notes, models, calculators, and 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.

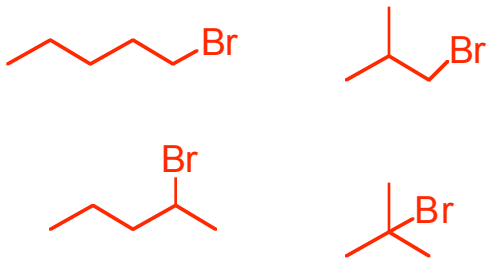
PLEASE read the questions carefully!

Partial Periodic Table

1A							8A
1 H	2A	3A	4A	5A	6A	7A	2 He
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	

Name:_____

1 (20 pts) a)Draw all the possible constitutional isomers with molecular formula C_4H_9Br. Use molecular graphs (bond-line formulas; no wedges and dashes, no hydrogens, no lone pairs on bromine). Draw each isomer only once.



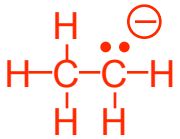
b) Arrange the following three organic compounds in order of decreasing Bronsted acidity.

CH_3NH_2	CH_3CH_3	CH_3OH
1	**2**	**3**

3 > **1** > **2**

Strongest acid — Weakest acid

c) Draw a valence bond structure, showing all atoms, lone pairs, and formal charges, for the conjugate base of ethane (compound **2**). Indicated the hybridization of each carbon atom on your drawing by name (that is, the name of the hybridization).

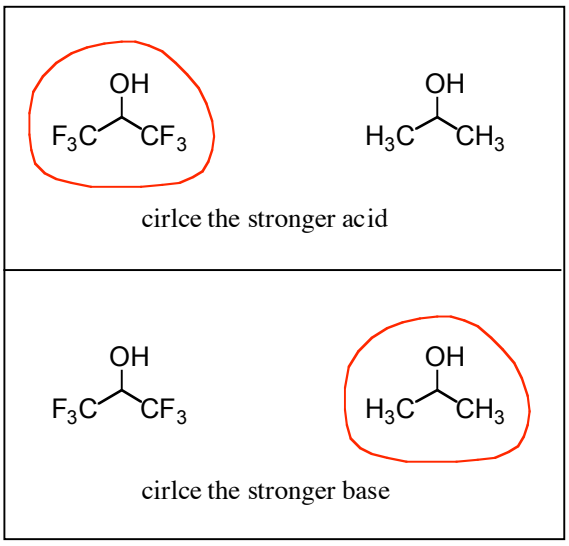


both carbons are sp^3 hybrids

Name:_____

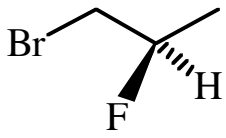
1 – continued

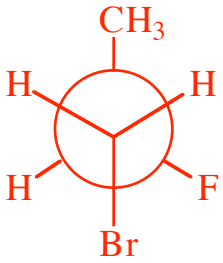
d) Like water, alcohols can act as Bronsted acids or Bronsted bases. For the two alcohols below, circle the stronger acid in the top box, and the stronger base in the bottom box.



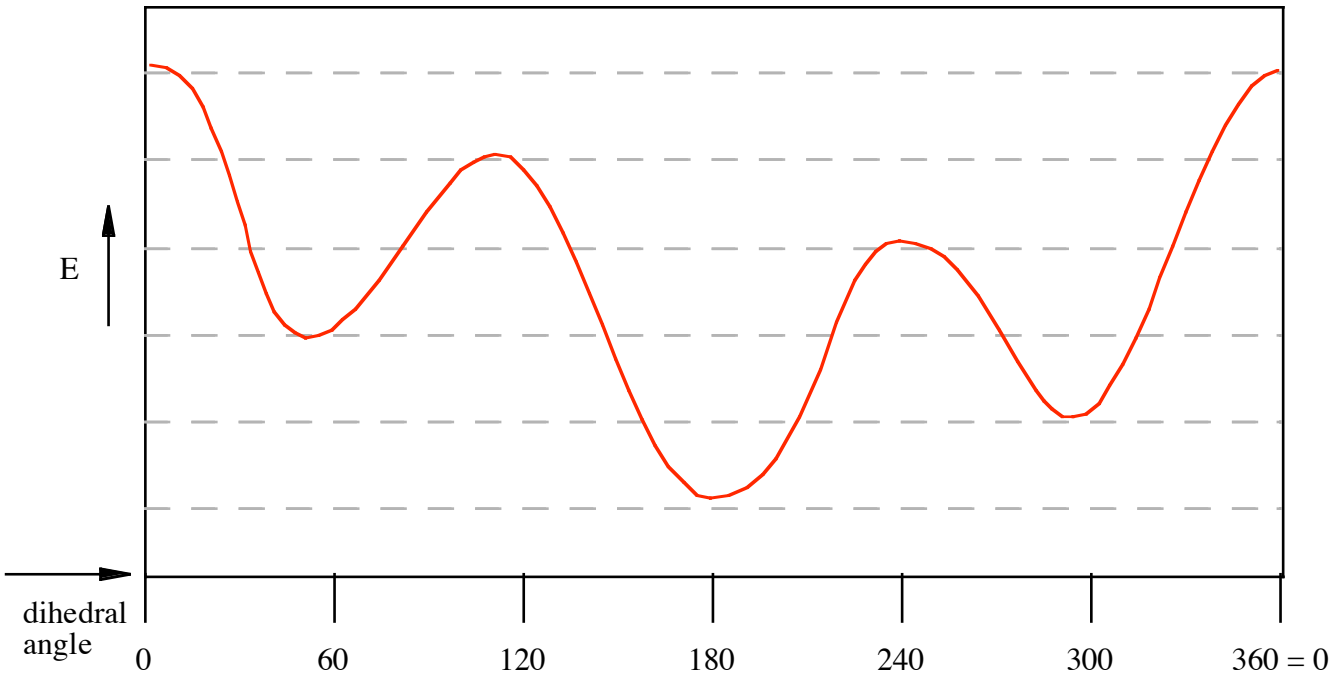
Name:_____

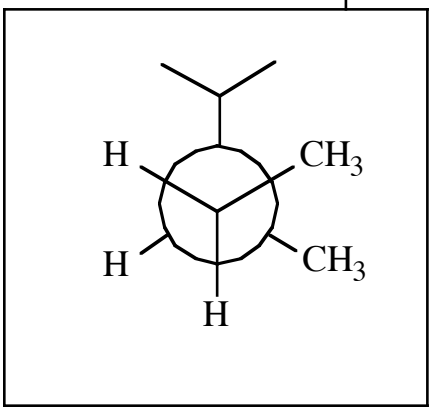
2) (20 pts) a) Draw a Newman projection, sighting down the C(1)-C(2) bond, of the 1-bromo-2-fluoropropane conformation indicated by the wedges and dashes structure shown.

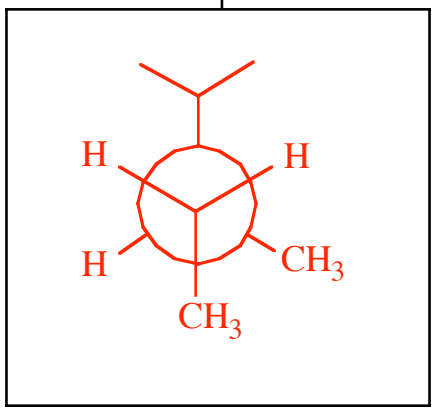


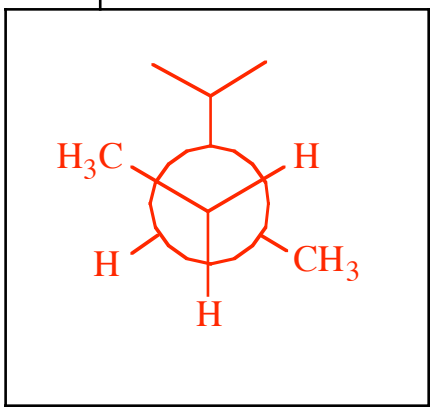


b) Complete the conformational energy diagram below for rotation about the C(4)-C(3) bond of 2,3-dimethylpentane. The dihedral angles are for the C(5)-C(4), and C(3)-C(2) bonds (the 60° dihedral conformation is given). Please rotate the FRONT carbon (which is C(4)). Be sure to carefully indicate the relative energy of each well and barrier in your energy diagram, and draw Newman projections for the 180° and 300° conformations.



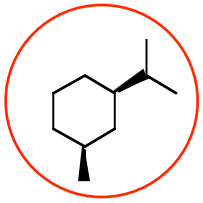




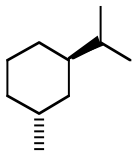


Name:_____

3) (15 pts) a) Wedges and dashes structures of cis- and trans-1-methyl-3-isopropylcyclochexane are given below. Circle the more stable isomer.

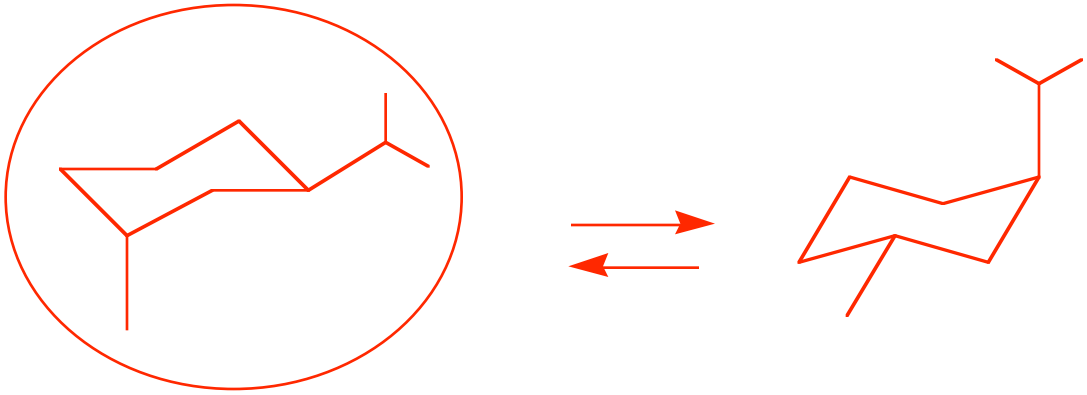


1



2

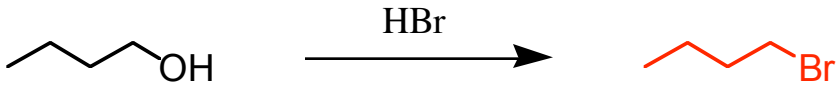
b) Give perspective chair drawings for the two flip-chair forms of the trans isomer (**2**). Do not show the hydrogens on the drawings.

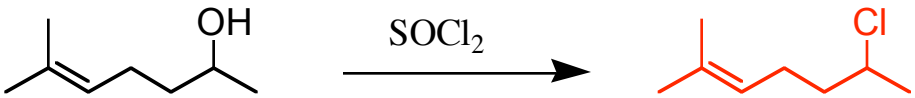


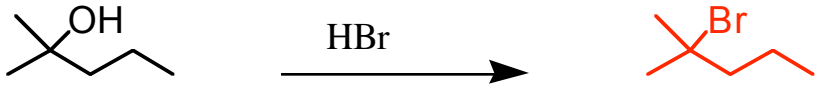
c) Circle the more stable conformation in part 3b. If the two conformations have the same energy, label then "same."

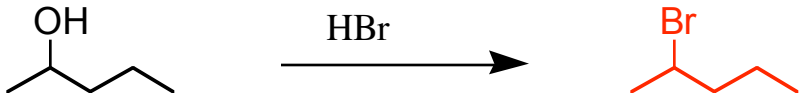
Name:_____

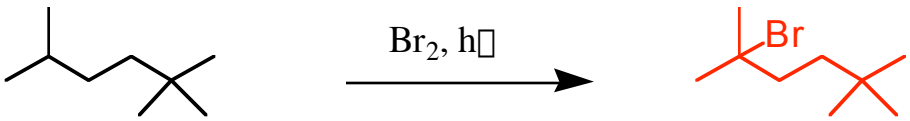
4) (20 pts) Give a valence bond (bond-line) structure for the single major organic product of each of the following reactions.

a) 

b) 

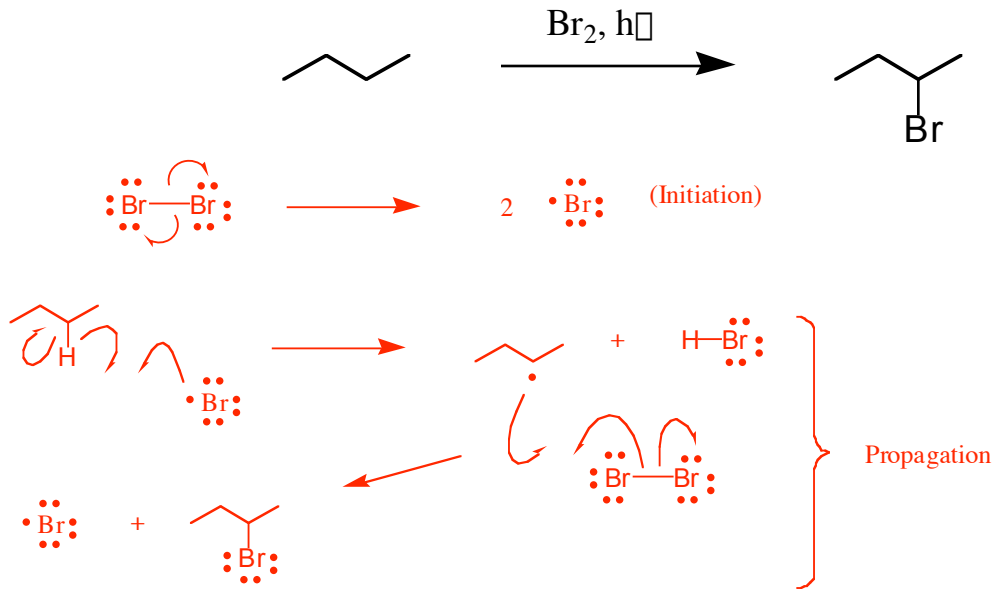
c) 

d) 

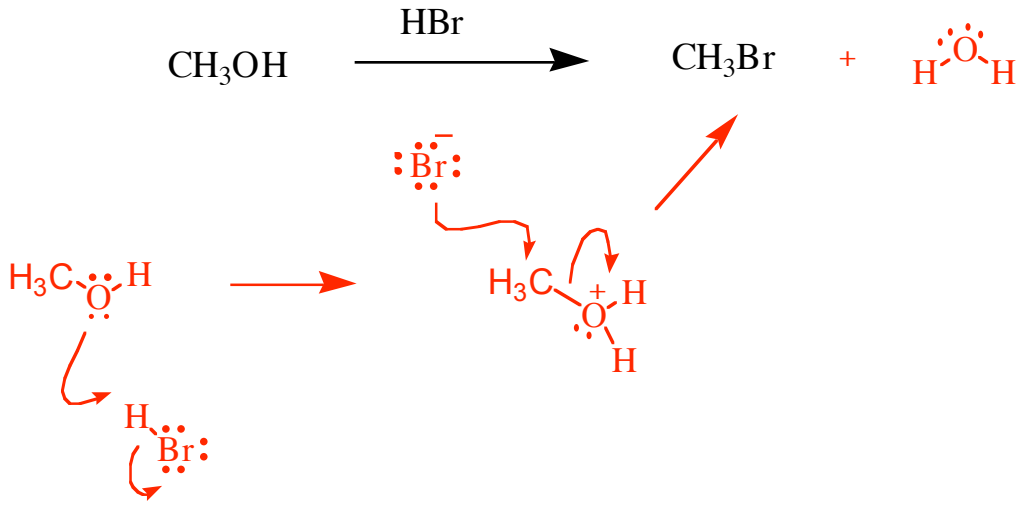
e) 

Name:_____

5) (25 pts) a) Propose an arrow-pushing mechanism for the following transformation. Show the initiation step and the propagation steps (yes, this is a hint). Be sure to show all non-bonded valence electrons and formal charges in your structures. Show only intermediates in your mechanism (no transition states).



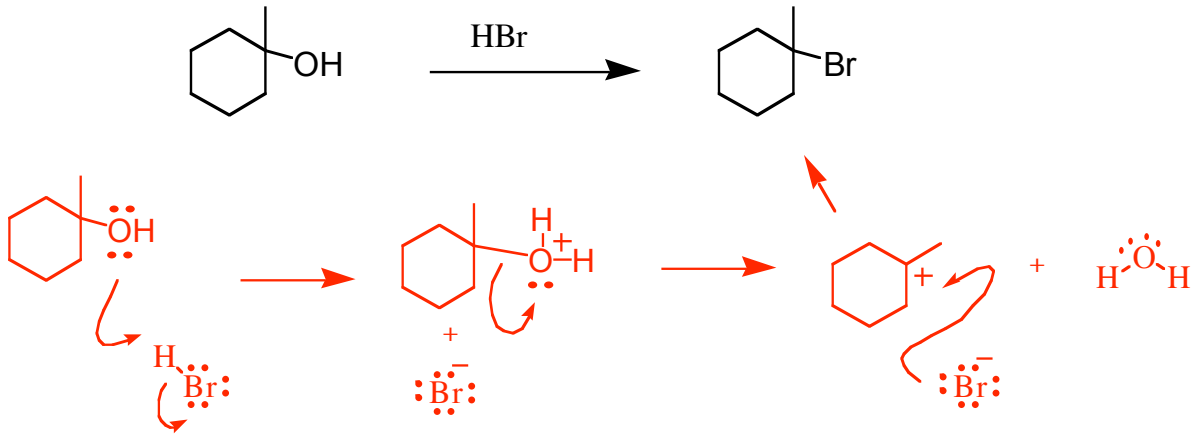
b) Propose an arrow-pushing mechanism for the following transformation. Be sure to show all non-bonded valence electrons and formal charges in your structures. Show only intermediates in your mechanism (no transition states).



Name:_____

5 – continued

c) Propose an arrow-pushing mechanism for the following transformation. Be sure to show all non-bonded valence electrons and formal charges in your structures. Show only intermediates in your mechanism (no transition states).



d) For the following reactions, circle the faster reaction.