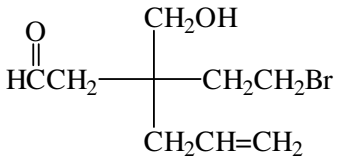
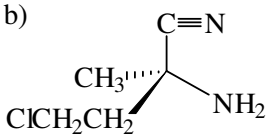
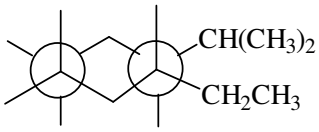
CHM 201-01 Organic Chemistry I Name_____
Hour Exam II
October 12, 2012 Signature_____

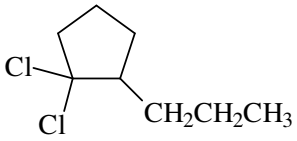
1.(12) In the following molecules, **rank the groups** in the molecules attached to the chiral centers in order of Cahn, Ingold, Prelog (CIP) priority (**1 = highest; 4 = lowest priority**) and assign the absolute configuration (***R* or *S***). For full credit, you must rank the groups 1-4.

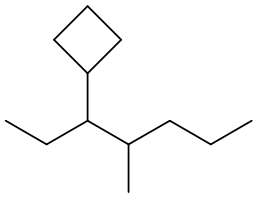
a) 

b) 

2.(12) Name the following compounds. Be sure to denote stereochemistry (*cis*, *trans*) where appropriate.

a) 

b) 

c) 

3.(14) Consider the molecule 2(*R*),3(*S*) 2-bromo-3-chlorobutane which has a $[\alpha]_D = -79^o$.

a) Draw the Fisher projection of this molecule with C_2 above C_3. Label it "**A**"

b) Draw the stereoisomer that has a $[\alpha]_D = +79^o$. Label it "**B**".

c) Draw 2 other stereoisomers and label them "**C**" and "**D**".

d) What is the stereochemical relationship between:

A & B _____
A & C _____
B & D _____
C & D _____

4.(18) Draw a staggered *Newman projection* of **2,3-dibromobutane** sighting along C_2-C_3 where the 2 Br atoms are **anti** *and* the 2 methyl groups (C1 and C4) are **anti**.

a) Rotate the rear carbon in 60° increments and draw the other 5 conformations. Using the data below determine the relative energy of both conformations and the barrier to rotation (kJ/mol).

Eclipsing	**kJ/mol**	**Gauche**	**kJ/mol**
H – H	4.0	$CH_3 – CH_3$	3.8
Br – H	5.0	CH_3 – Br	3.2
CH_3 – H	6.0	Br – Br	2.0
Br – Br	8.0		
CH_3 – Br	10.0		
$CH_3 – CH_3$	11.0		

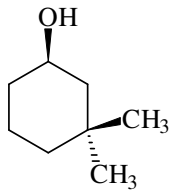
b) How many chiral centers are in this compound? _____

c) Determine the absolute configuration of any chiral centers.

d) Is this particular molecule optically active? _____ Explain.

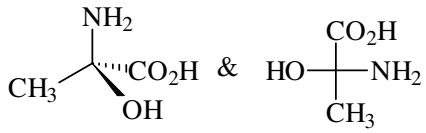
5.(16) The molecule 3,3-dimethylcyclohexanol is show below and consider the following information:

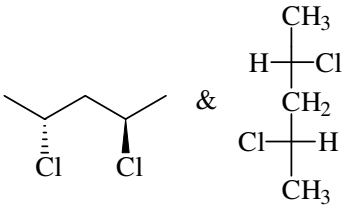
i) CH_3 – H 1,3-diaxial interaction = 3.8 kJ/mol
ii) OH – H 1,3-diaxial interaction = 2.1 kJ/mol
iii) OH - CH_3 1,3-diaxial interaction = 8.1 kJ/mol



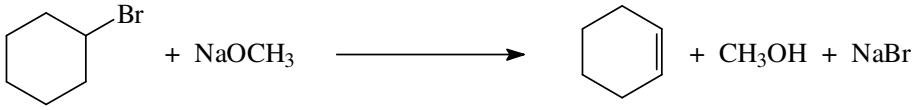
a) Above, draw the two flip *chair conformations* and identify any interactions present in each. **Highlight any H's** that are involved in 1,3-diaxial interactions.
b) Using the data provided, determine the relative energy of each conformation.

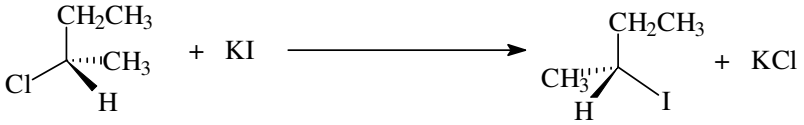
6.(14) Determine the absolute configuration (*R* or *S*) for each chiral center in the following pairs of molecules. Also determine if the pairs are *identical, enantiomers or diastereomers*.

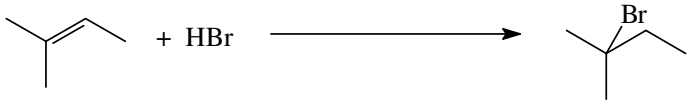
a) 

b) 

7.(12) Identify the following chemical reactions as either *rearrangement*, *elimination*, *substitution* or *addition*. Also identify the electrophile (E) and the nucleophile (N) in each reaction.

a) 

b) 

c) 

d) $CH_2{=}CHCH_2CH{=}CH_2 + H_3O^+ \text{(catalyst)} \longrightarrow CH_3CH{=}CHCH{=}CH_2$

8.(4) Briefly define the term “racemic mixture”. What is the specific rotation of a racemic mixture?