Name:_____

CHEMISTRY 3311, Fall 2000
Professor Walba
Third Hour Exam
November 16, 2000

scores:

1)

2)

3)

4)

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This is a closed-book "open model" exam. You may use models, but no notes or books. Please put all your answers on the test. Use the backs of the pages for scratch.

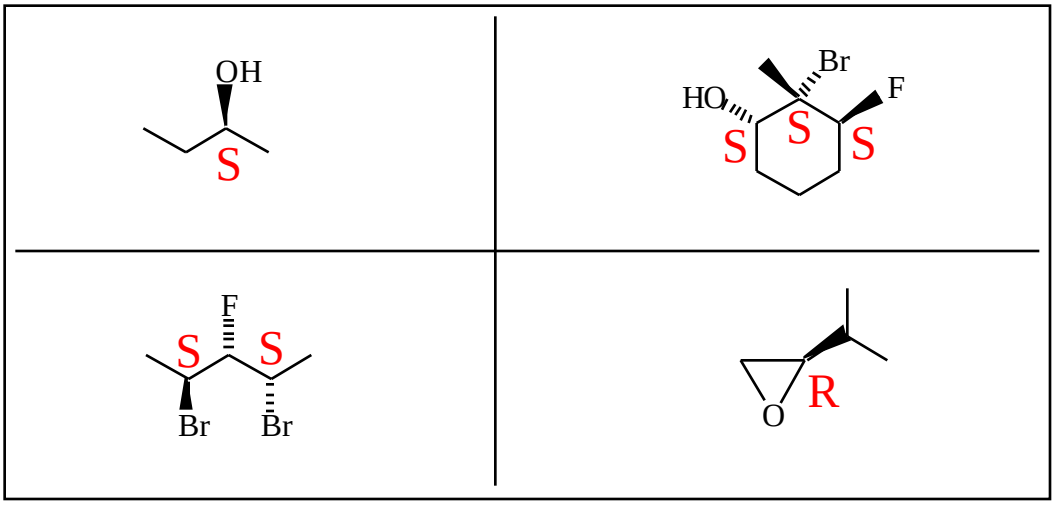
PLEASE read the questions carefully!

Partial Periodic Table

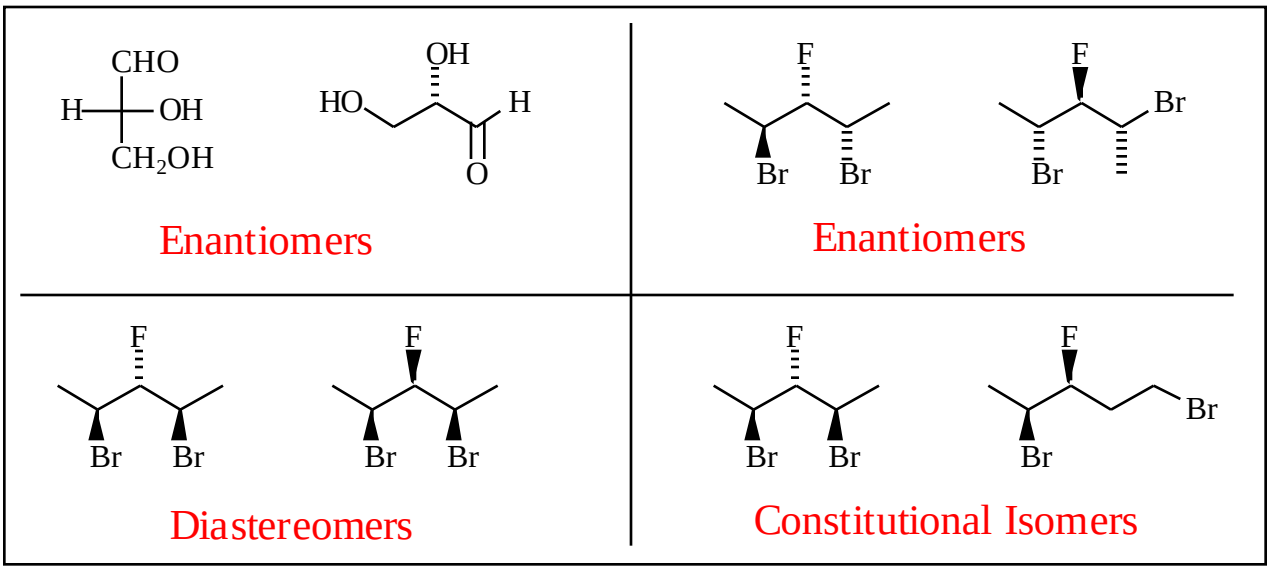
1A							8A
1 H	2A	3A	4A	5A	6A	7A	2 He
3 Li	4 Be	5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg	13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
						35 Br	
						53 I	

Name:_____

1) (25 pts) a) Label each tetrahedral stereogenic center in the following structures using the R or S stereochemical descriptors. Be careful to indicate which stereocenter goes with each descriptor.

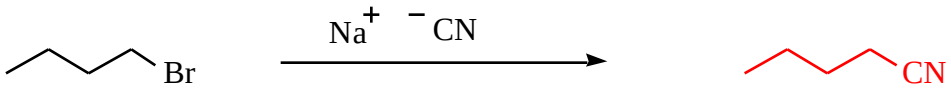


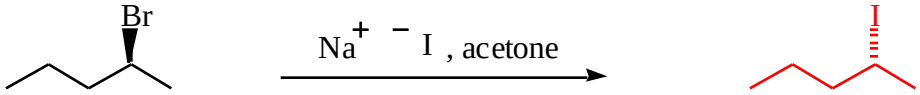
b) Label each of the following pairs of structures as homomers, conformers, enantiomers, diastereomers or constitutional isomers. In our class, conformers are NOT enantiomers or diastereomers. This question relates to the description of chemical compounds at room temperature on a long time scale. For example, enantiomeric structures represent molecules which, when present in a large ensemble of molecules comprising macroscopic samples of material, can be purified into two separate isomers with equal magnitude but opposite sign of rotation of polarized light.

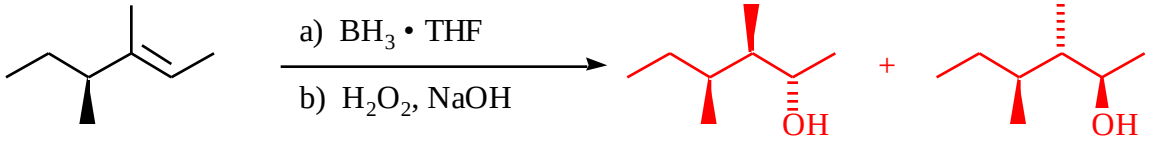


Name:_____

2) (25 pts) Give the major product of each of the following reactions. If I ask for more than one product, then give all the major products. Use wedges and dashes to indicate stereochemistry in your answer if appropriate. If a racemate is formed, show only one enantiomer and label it "rac."

a) 

b) 

c) 

Give ALL products!

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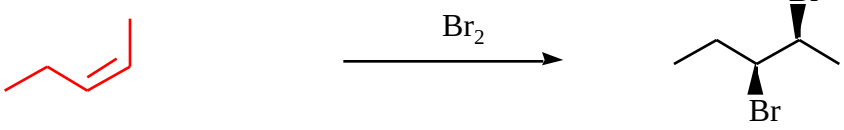
d) 

Give the Starting material!

rac

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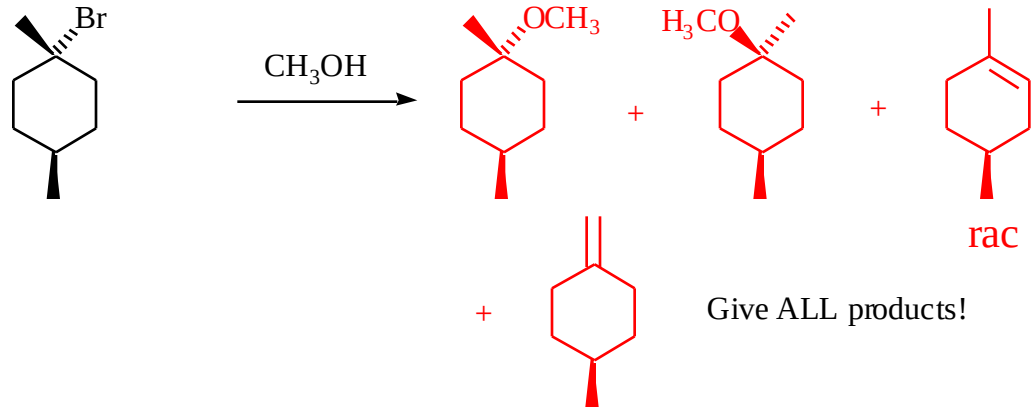
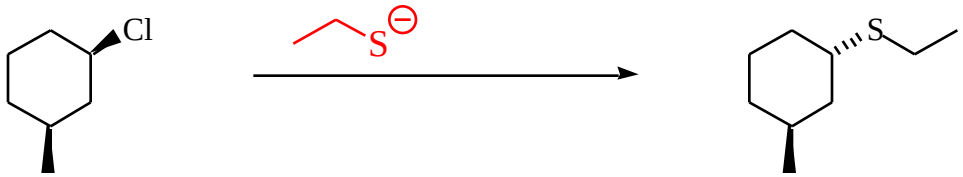
e) 

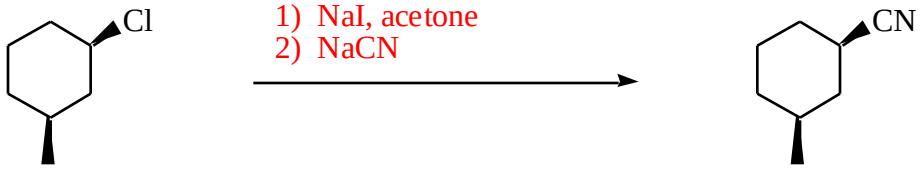
rac

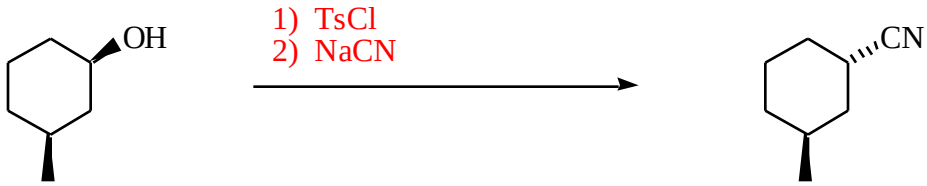
Give ALL products!

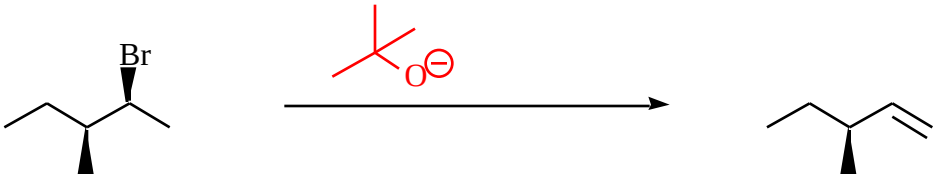
Name:_____

3) (20 pts) Propose reagents for accomplishing the following transformations. NOTE: More than one step may be required! Try to make your synthesis efficient (i.e. the desired product should be the major product). You must use the starting material given, and you may use any other organic or inorganic reagents you need.

a) 

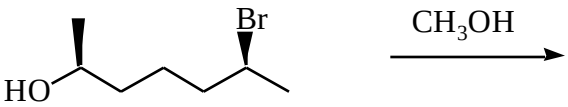
b) 

c) 

d) 

Name:_____

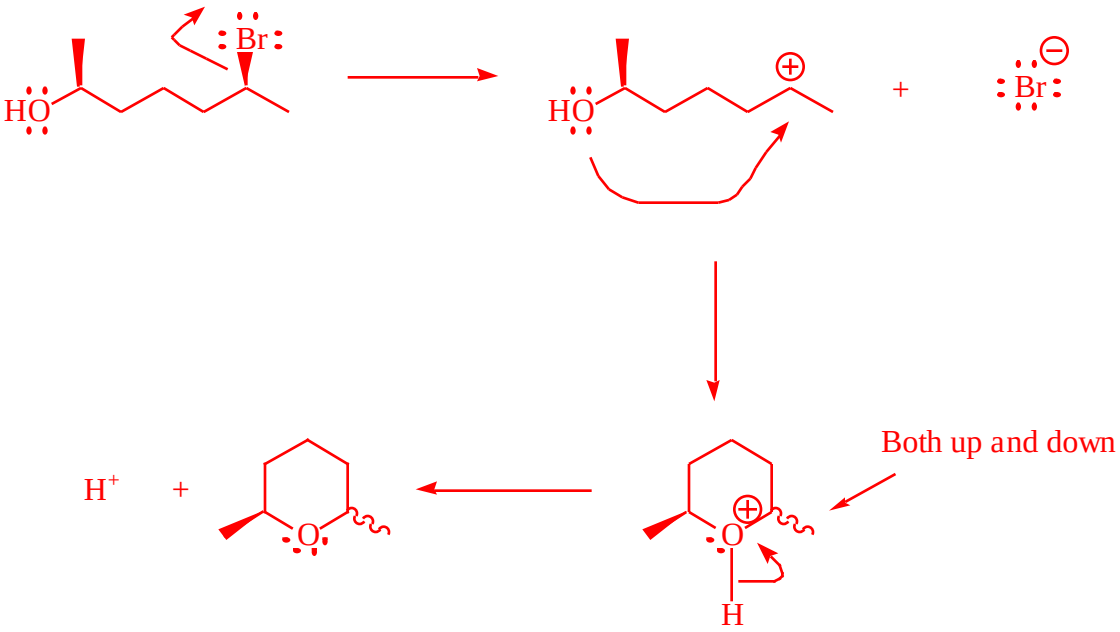
4) (30 pts) a) When the bromo-alcohol **1** is treated dissolved in methanol and heated, all of the starting material disappears, and two new products (with different physical properties) are formed. Amazingly, NEITHER product has an OCH_3 group or a double bond! Propose structures for the two products.



1

TWO products, both with molecular formula $C_7H_{14}O$

b) Propose an arrow-pushing mechanism for the transformation given in part 4a. Carefully show all intermediates in your mechanism.



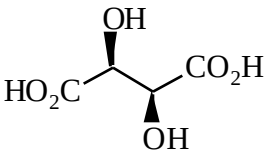
Name:_____

4 –continued-

c) The chair conformation of cis-1,2-dimethylcyclohexane shown below is chiral. Try as we might, however, we find it impossible to resolve this compound into two enantiomers at room temperature. Propose an explanation for this fact.

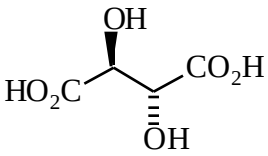
This is one of those interesting cases where the chair-flip of a cyclohexane ring gives a non-superposable mirror image of the original structure. Since the two mirror-image structures are rapidly interconverting through the chair flip, they cannot be isolated as separate compounds (resolved), though each structure is chiral. These structures are conformations, not enantiomers.

I have drawn two isomers (**1** and **2**) of the famous tartaric acid using wedges and dashes.



1

Chiral

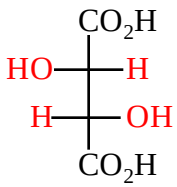


2

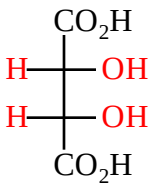
Achiral

d) Label each isomer as chiral or achiral.

e) Complete the Fischer projections for these compounds below (be sure to label them with the compound numbers).



1



2