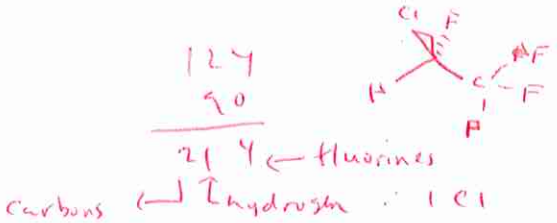
Organic 211 Test # 2 September 29, 2020

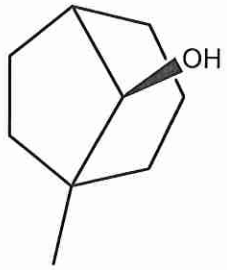
Name:_____

1) Nomenclature: Name or draw the following molecules using either IUPAC or common rules. (3 pts. each)



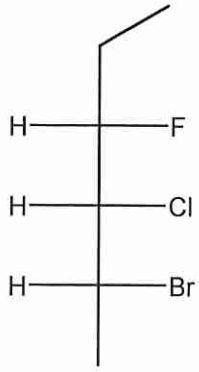
124
90
214 ← fluorines
carbons ← 1 hydrogen : 1 Cl

a) R-124 (R enantiomer)



b)

8R-1-methylbicyclo[3.2.1]octan-8-ol

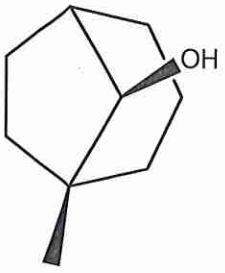


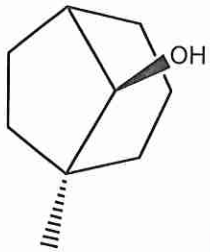
c)

d) Meso-cis-1,3-dibromocyclohexane

2R,3S,4S-2-bromo-3-chloro-4-fluorohexane

2) Describe how the molecules are related. Your choices are enantiomer, diasteromer, constitutional isomer, conformational enantiomer, the same because they are meso, identical and not meso, and no relation. (3 pts. each)



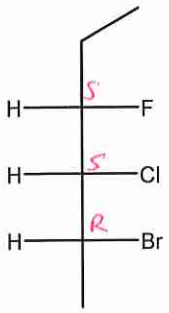


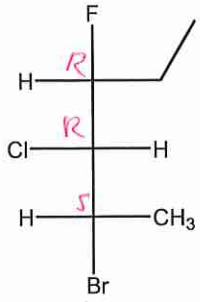
a) diasteromer

one chiral center
the same
one chiral center
different

15/15

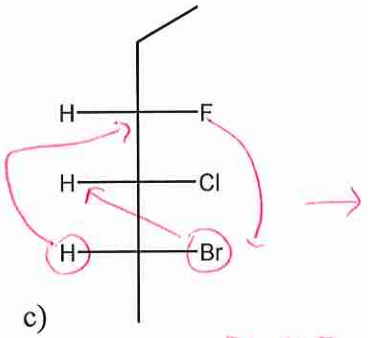
b)



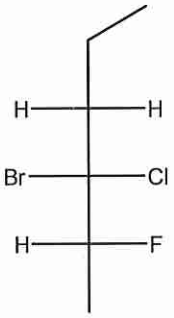


Enantiomer

c)



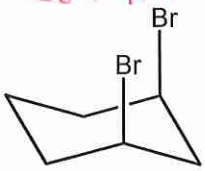
$C_6H_{11}BrClF$

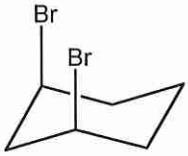


$C_6H_{11}BrClF$

Constitutional isomer

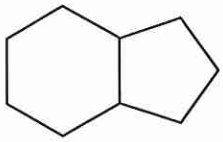
d)

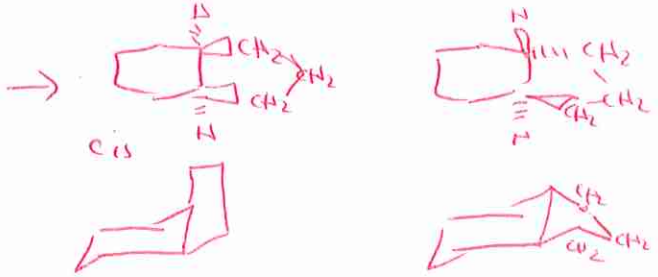




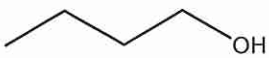
Same because they are meso

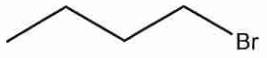
3) The molecule below can exist with either a trans or cis junction between the two rings. Draw both the trans and cis isomers labeling them. (4 pts.)





4) What is the atom economy for the following reaction? SHOW YOUR WORK!! (4 pts.)



+ NaBr + H_2SO_4 → 

+ $NaHSO_4$ + H_2O

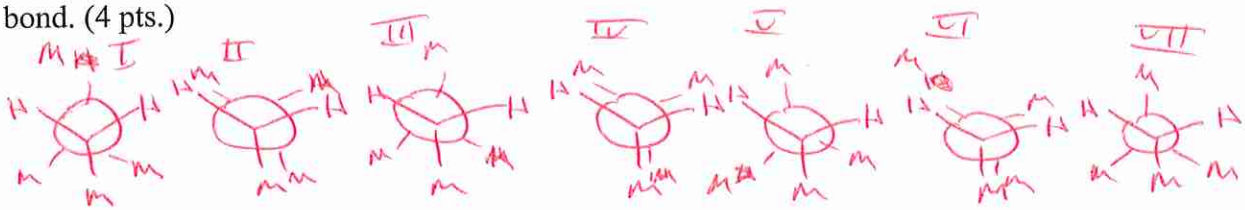
74.121 102.89 98.08

275.09

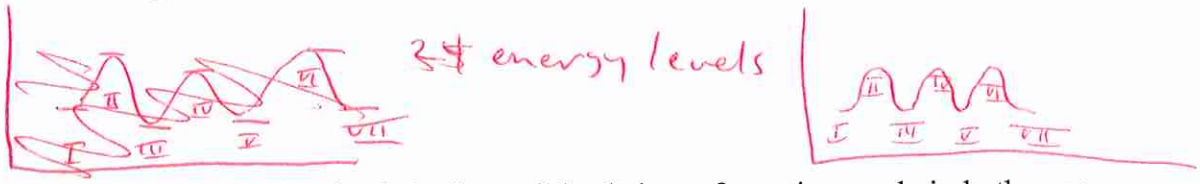
137.02 g/mole

$$\frac{137.02}{275.09} = 49.8\%$$

5) a) Draw the seven Newman projections for 2,2-dimethylbutane looking down the C_3-C_2 bond. (4 pts.)

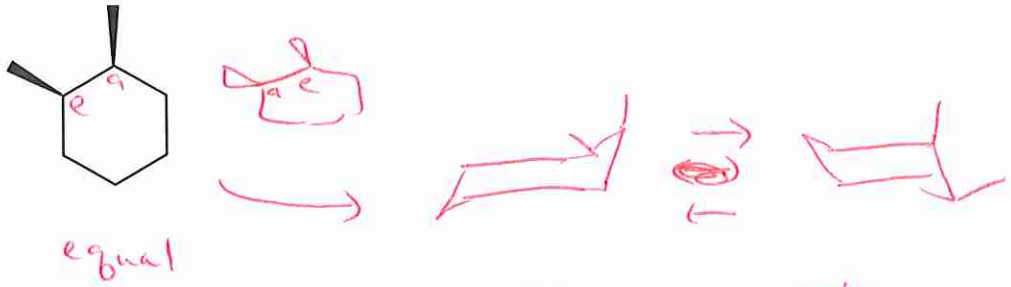


b) Give the energy versus rotation diagram for the seven projections in part a. (3 pts.)

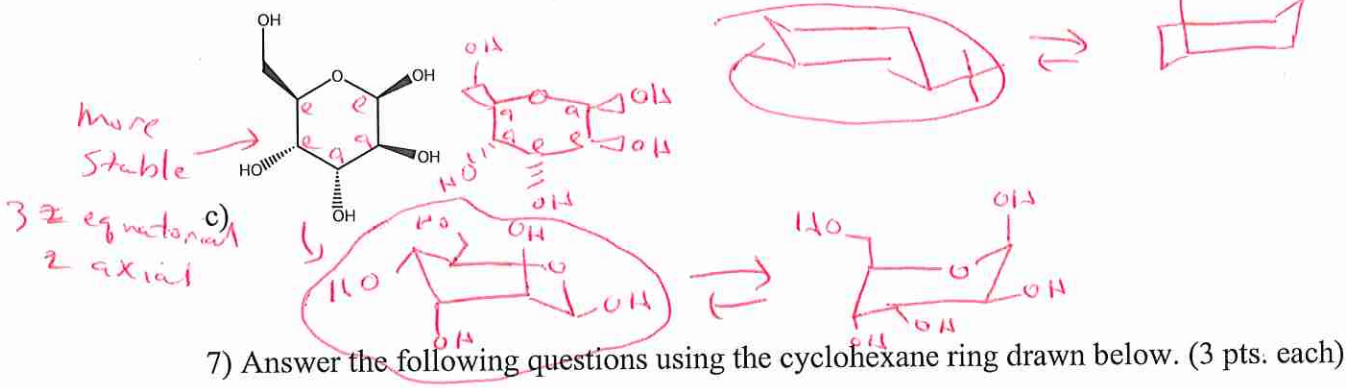


6) Draw the following molecules in both possible chair conformations and circle the one that is most stable. If they are equal in stability, indicate this fact. (4 pts. each)

a)

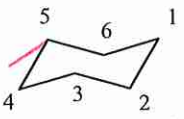


b) cis-1-tert-Butyl-3-methylcyclohexane



c)

7) Answer the following questions using the cyclohexane ring drawn below. (3 pts. each)



a) Is a methyl group at C-5 that is "down" axial or equatorial?

b) Is a methyl group that is "up" at C-1 more stable, less stable, or of equal stability than a methyl group that is up at C-2? methyl

less stable, C-1 is axial while C-2 methyl is equatorial

c) Place a methyl group at C-4 in its most stable orientation. Is it up or down?

equatorial

8) D-fructose has an optical rotation of -92. You have a fructose mixture that gives a rotation of +30.6. a) what is the % e.e.? b) How much of D-fructose do you have in your mixture? SHOW YOUR WORK. (4pts.)

$\frac{30.6}{92} = 33.3\%$ e.e.

$33\% + \frac{67}{2} =$

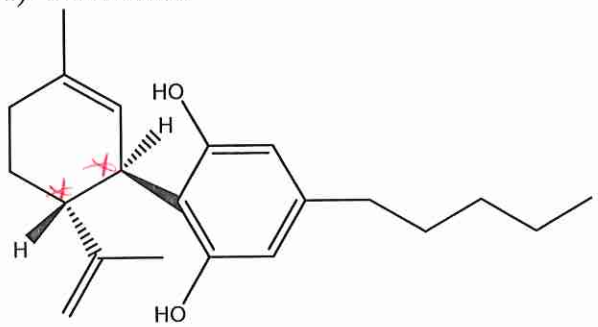
33.3
33.35
66.65 L

33.35 D

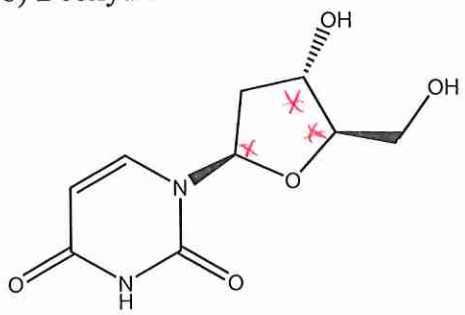
observed is + so more L than D.

9) Identify the chiral centers in the following molecules. Indicate a chiral center with an asterisk. (3 pts. each)

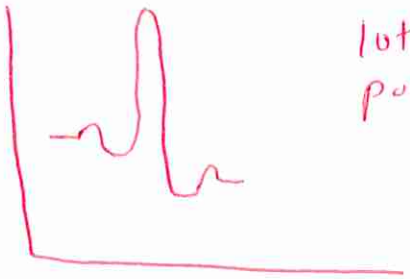
a) Cannabidiol



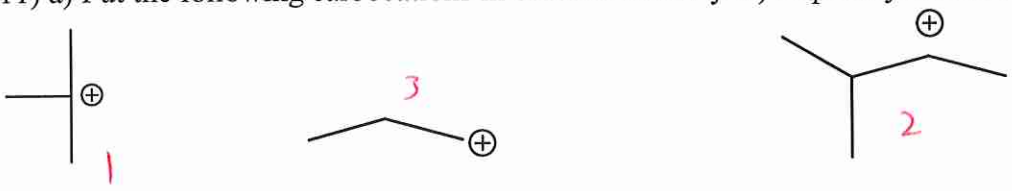
b) Deoxyuridine



10) Draw a potential energy diagram for a three step reaction. The first two steps are exothermic with the last step being endothermic. Step three also has a very low energy of activation while step 2 has the highest activation energy. (5 pts.)

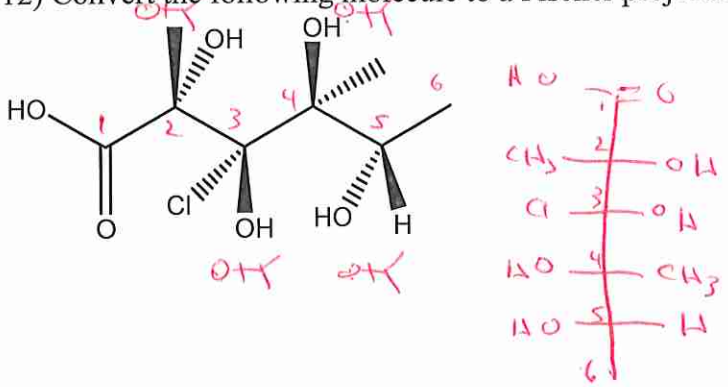


11) a) Put the following carbocations in order of stability. b) Explain your order. (3 pts.)



tertiary carbocation more stable than secondary carbocation more stable than primary carbocation due to hyperconjugation

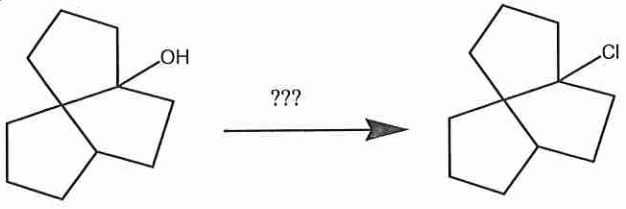
12) Convert the following molecule to a Fischer projection. (4 pts.)



Reactions: Give the missing reactant, reagent or product of the following reactions. Show the organic product and it is not necessary to show the by-products. Indicate if no reaction is possible. (3 pts. each)

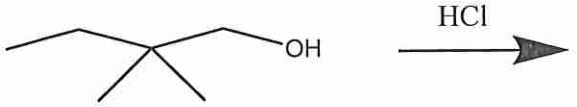
13)

a)



HCl or $SOCl_2$

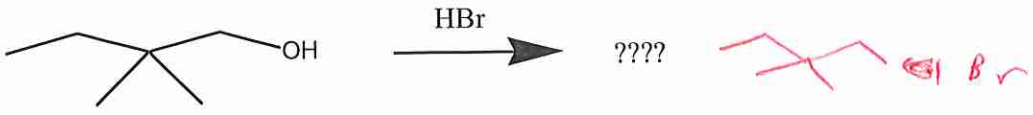
b)



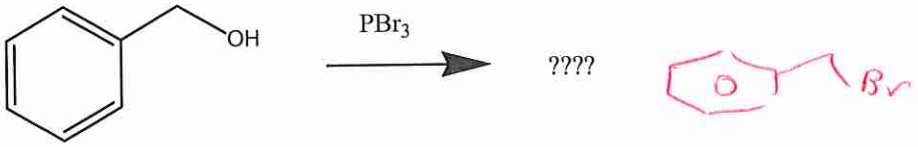
No reaction due to being a primary alcohol.

c)

d)



e)



14) Give me something you studied that I did not ask. (3 pts.)