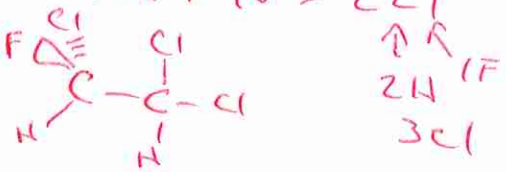
Organic 211 Test # 2 A1, B1 October 1, 2020

Name:_____

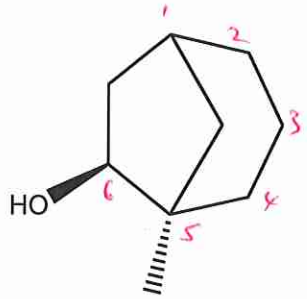
1) Nomenclature: Name or draw the following molecules using either IUPAC or common rules. (3 pts. each)

131 + 90 = 221

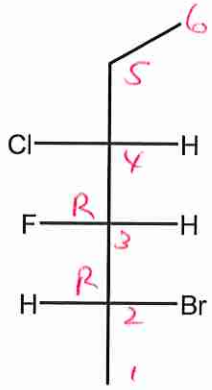


2H 1F 3Cl

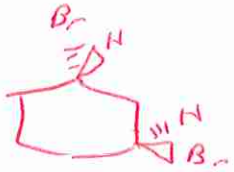
a) R-131 (S enantiomer)



b) 5R,6S-5-methylbicyclo[3.2.1]octan-6-ol



c)

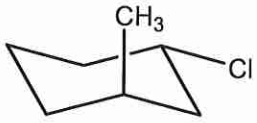


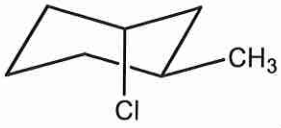
d) (1S,3S)-1,3-dibromocyclohexane

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

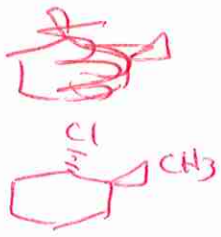
2) Describe how the molecules are related. Your choices are enantiomer, diasteromer, constitutional isomer, conformational enantiomer, the same because they are meso, identical and not meso, and no relation. (3 pts. each)

a)

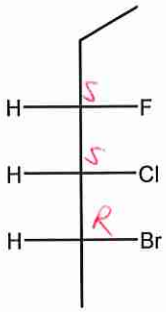


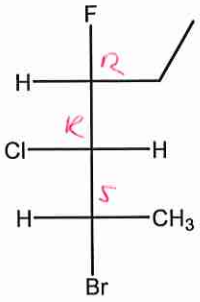


identical and not meso



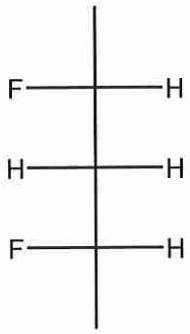
b)

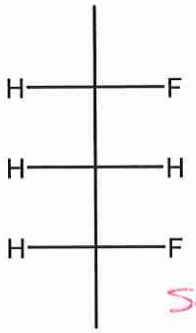




enantiomer

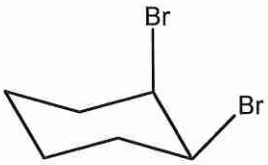
c)

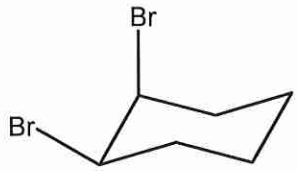




Same because they are meso

d)

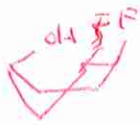




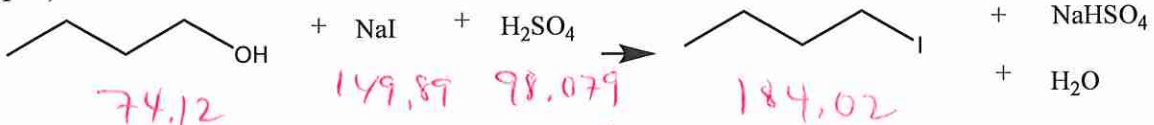
conformational enantiomer

3) Draw the most stable conformation of CIS-4-fluorocyclohexan-1-ol. Explain why this is the most stable conformation. 4 pts.

OH and fluorine are attracted to each other. they do not want to be eclipsed but close. ∴ twist-boat is most stable



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

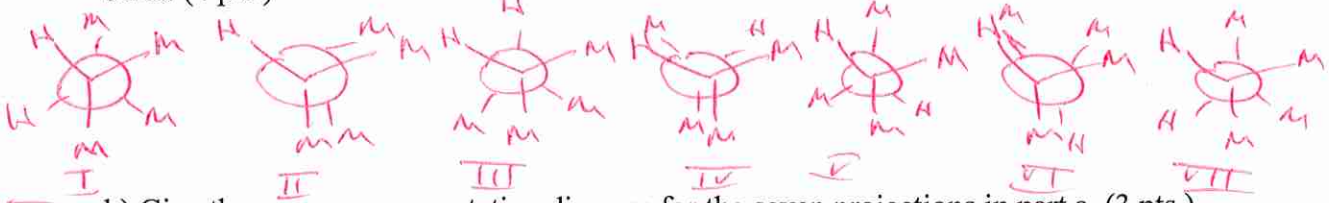


74.12 149.89 98.079 184.02

322.089

$$\frac{184.02}{322.089} = 57.1\%$$

5) a) Draw the seven Newman projections for 2,3-dimethylbutane looking down the C_2-C_3 bond. (4 pts.)



I = III = VII

II

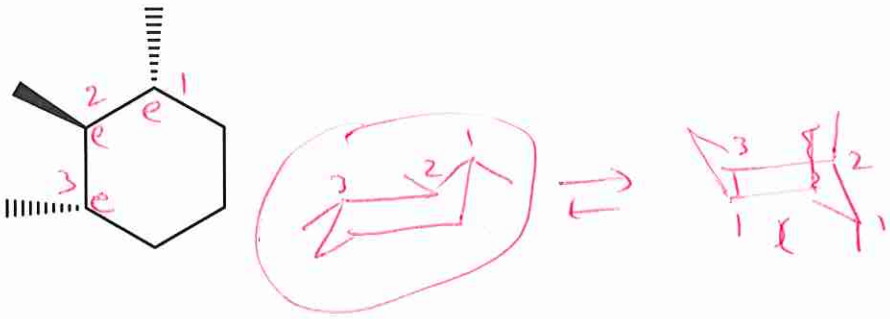
IV = VI

V

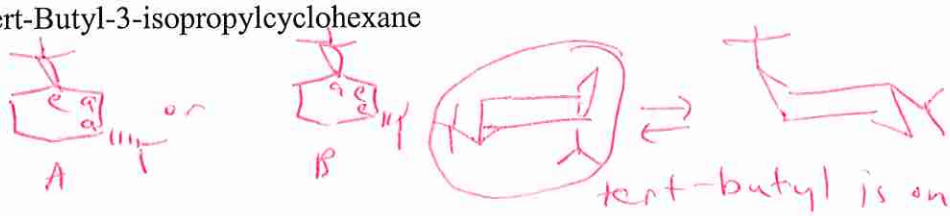
b) Give the energy versus rotation diagram for the seven projections in part a. (3 pts.)

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)

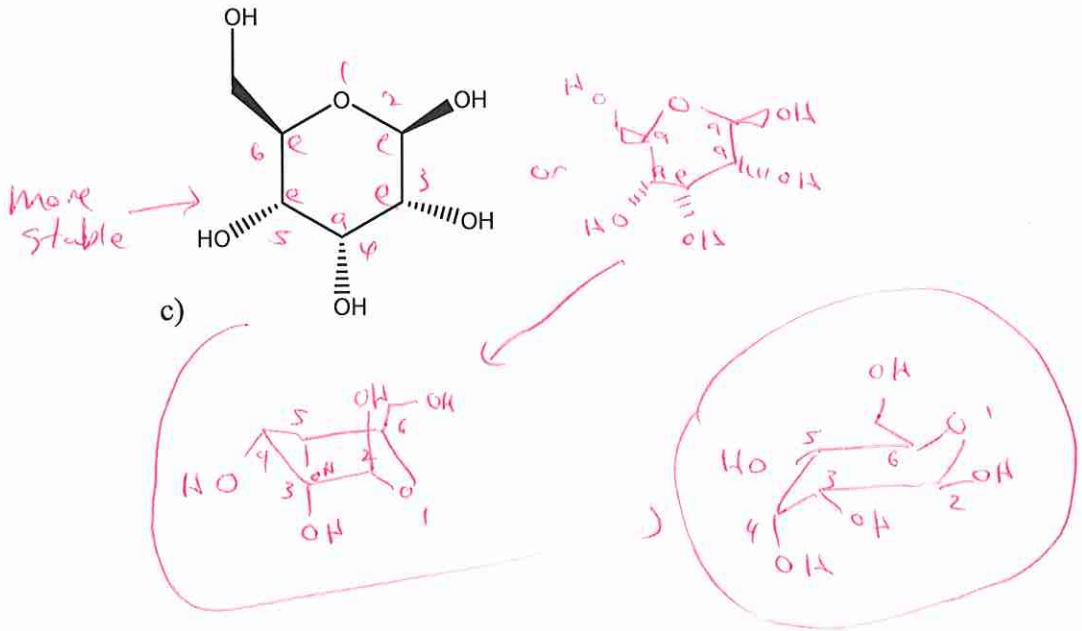
a)



b) trans-1-tert-Butyl-3-isopropylcyclohexane



c)

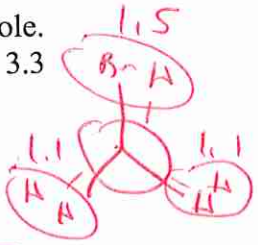


7) The rotational energy barrier about the C-C bond in ethyl bromide is 3.7 kcal/mole. What is the energy cost of C-Br bond? Assume the eclipsed ethane conformation is 3.3 kcal/mole less stable than the staggared conformation. SHOW YOUR WORK. (4 pts.)

means each C-H eclipse is 1.1

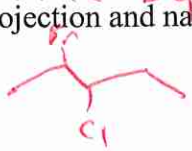
2 × 1.1 = 2.2

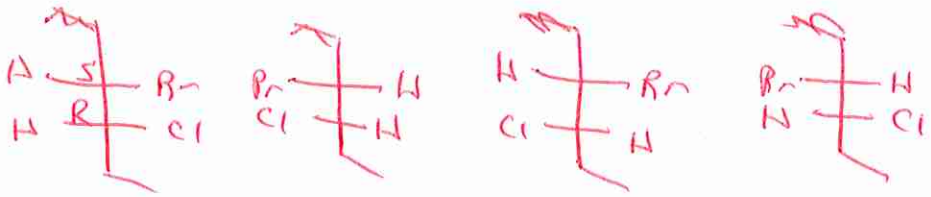
3.3 kcal/mole so divide by 3



3.7 − 2.2 = 1.5 for C-Br

8) Draw in a Fischer projection and name ALL of the stereoisomers of 2-bromo-3-chloropentane. (5 pts.)





2S,3R 2R,3S 2S,3S 2R,3R – 2-bromo-3-chloro pentane

9) D-fructose has an optical rotation of -92. You have a fructose mixture that gives a rotation of -62.6. a) what is the % e.e.? b) How much of D-fructose do you have in your mixture? SHOW YOUR WORK. (4pts.)

$\frac{62.6}{92} = 68\%$

9)

$68 + \frac{100-68}{2}$

$.16 + 16 = 84\%$

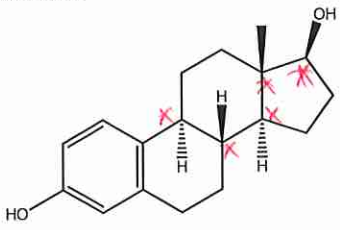
84 % D

16 % L

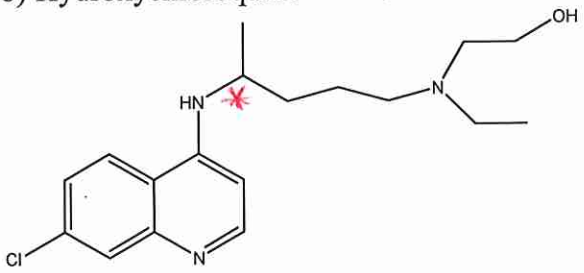
10) Identify the chiral centers in the following molecules. Indicate a chiral center with an asterisk. (3 pts. each)

Estradiol

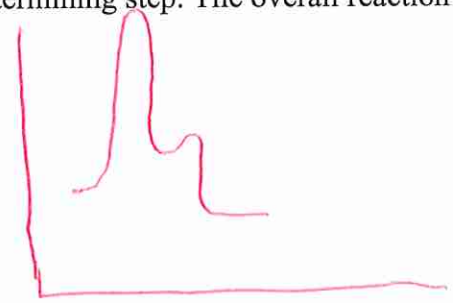
a)



b) Hydroxychloroquine

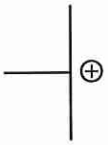


11) Draw a potential energy diagram for a two step reaction. Step 1 is endothermic and the rate-determining step. The overall reaction is exothermic. (5 pts.)

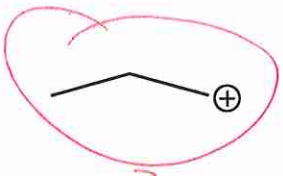


lots of possibilities

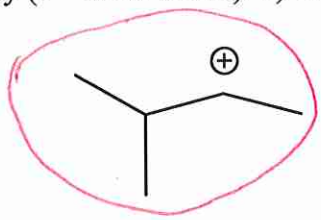
12) a) Put the following carbocations in order of stability (1 = most stable). b) Circle the carbocations that will rearrange. (3 pts.)



1

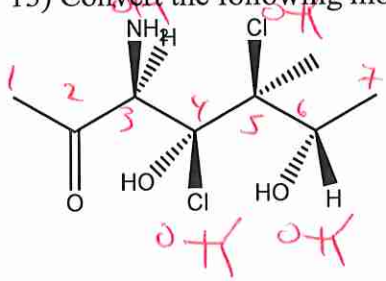


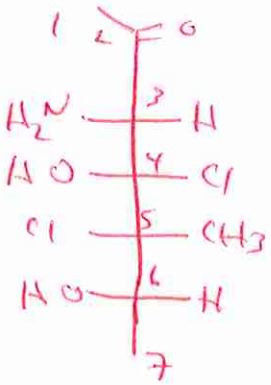
3



2

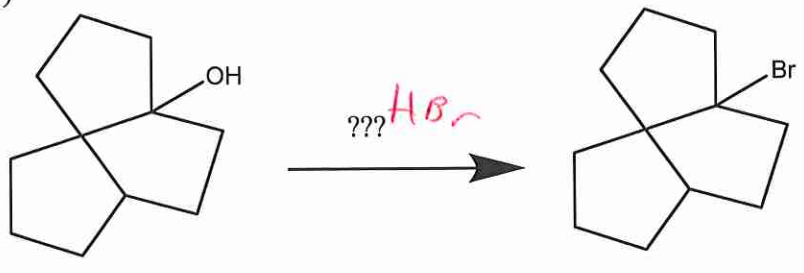
13) Convert the following molecule to a Fischer projection. (4 pts.)

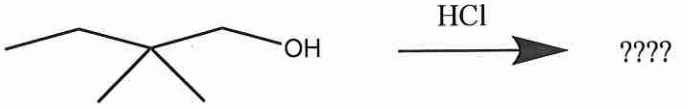




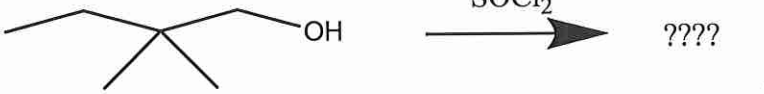
Reactions: Give the missing reactant, reagent or product of the following reactions. Show the organic product and it is not necessary to show the by-products. Indicate if no reaction is possible. (3 pts. each)

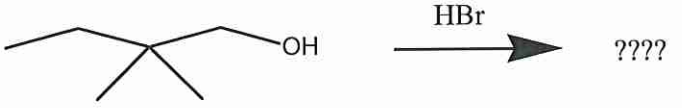
14)

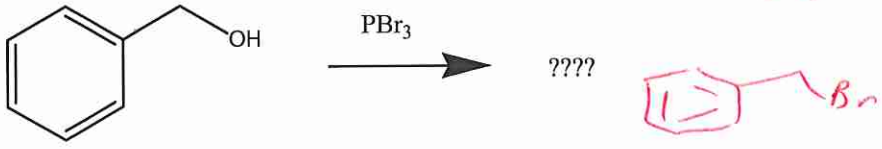
a) 

b) 

no reaction possible.

c) 

d) 

e) 

15) Give me something you studied that was not asked on this test. (3 pts.)