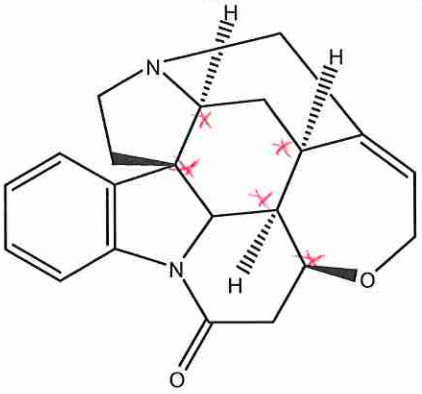
Assignment # 9
Organic 211
Fall 2020

Name:_____

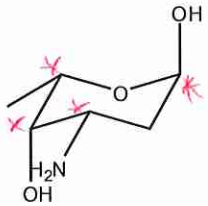
1) For the following two molecules, indicate the stereocenters (if any) with an asterisk.

a)



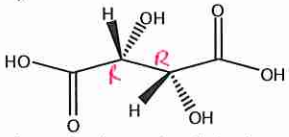
Strychnine

b)



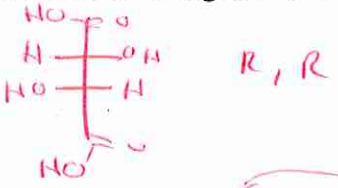
L-Daunosamine

2) Given below is one of the stereoisomers of Tartaric acid.



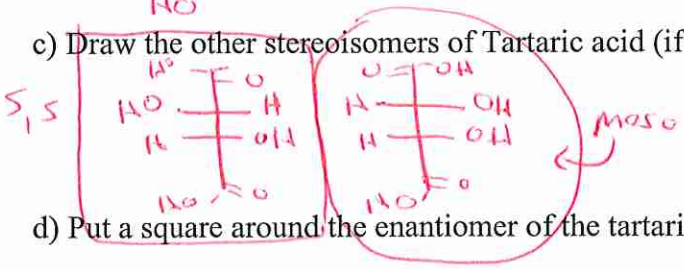
a) Label each chiral center as R or S.

b) Convert the drawing above into a Fischer projection.



R, R

c) Draw the other stereoisomers of Tartaric acid (if any) in Fischer projections.



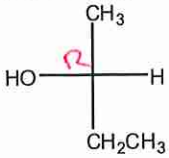
S, S

Meso

d) Put a square around the enantiomer of the tartaric acid given.

e) Put a circle around a diasteromer of the tartaric acid.

3) Using the Fischer projection of (R)-2-butanol given, explain how each of the following affects the configuration of the chirality center.

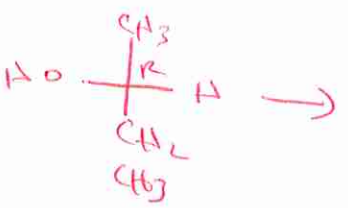


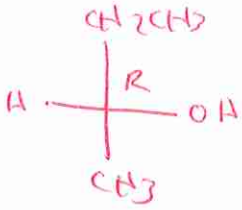
a) Switching the positions of H and OH

Gives the enantiomer (leaving 2 groups the same and switching 2 groups gives enantiomer

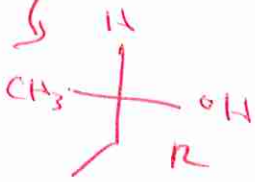
b) Switching the positions of three groups (e.g. putting H where CH_3 was, putting CH_3 where OH was and putting OH where H was, leaving ethyl in same location)

c) Rotating the Fischer projection 180° around an axis perpendicular to the page





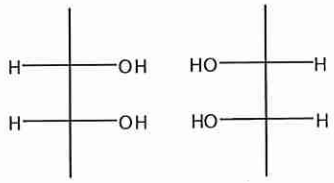
no change



no change

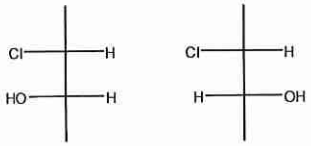
4) Indicate how the following molecules are related. Your choices are no relation, the same, constitutional isomers, enantiomers, or diasteromers. Meso

a)



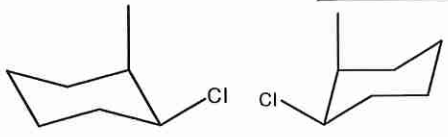
Meso

b)



diasteromers

c)



enantiomers

5) You have a mixture of two enantiomers in a 50 % R and 50 % S composition. a) What is the percent enantiomeric excess? b) What is the observed rotation?

50% R
− 50% S
0 % e.e

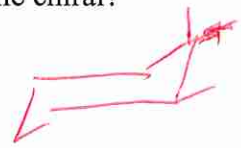
0 = 0 / specific

no rotation for a racemic mixture

6) Give an example of a cyclohexane that is substituted cis-1,2 with different substitutents. Is the cyclohexane chiral?

chiral, no plane of symmetry

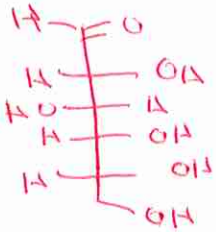
7) Give an example of a cyclohexane that is substituted cis-1,2 with the same substituents. Is the cyclohexane chiral?



no plane of symmetry.
∴ chiral

8) Give a molecule in a Fischer projection that can have 16 stereoisomers

Copied #10.

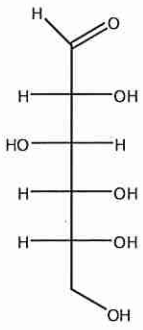


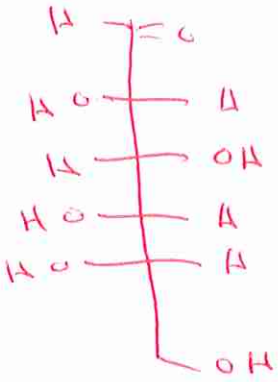
4 stereocenters = 16 stereo isomers

9) What is the difference between D/L and d/l?

Big D and L are nomenclature descriptions.
Little d and l are light rotation descriptions.

10) Given below is D-glucose. Draw its enantiomer.





11) An aqueous solution containing 10 g of optically pure fructose was diluted to 500mL with water and placed in a polarimeter tube 20 cm long. The measured rotation was -5.20°. Calculate the specific rotation of fructose. SHOW YOUR WORK!

$\frac{10\,g}{500\,mL} = \frac{2\,g}{100\,mL}$ $[\alpha] = \frac{\alpha}{c \cdot l} = \frac{-5.20 (100)}{2\,g \times 2\,dm}$

$= -130$

12) If the solution in question 11 was mixed with 500 mL of a solution containing 5 g of racemic fructose, what would be the specific rotation of the resulting fructose mixture? What would be its optical purity?

10g from question 11.

$\frac{10}{15}(-130°) = -87°$ for rotation

$10/15$ = 66.7% enantiomeric excess