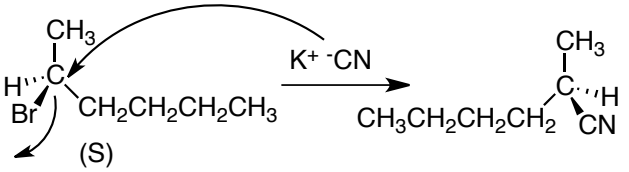
L. I. U.

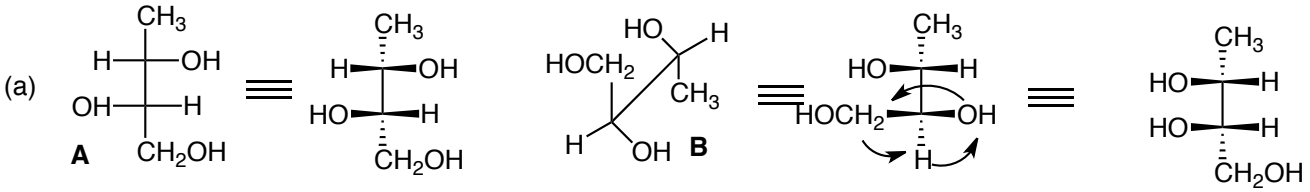
Chem. 121, Sect 008, Exam III Fall, 2011, 100 points

1. (a) Give the product that is formed when optically active (S)-3-bromohexane is heated with potassium cyanide and show the complete mechanism. (b) Assign the absolute configuration (R or S) to the product(s). (c) Is the reaction mixture optically active? Explain briefly. (15 pts)

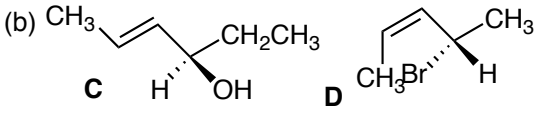


Yes, the reaction mixture is optically acitve since S_N2 reactions occur with complete inversion of configuration.

2. Give the relationship between the following pairs of molecules. They may be the same molecule, different molecules, constitutional isomers, diastereomers, or enantiomers. (10 pts)

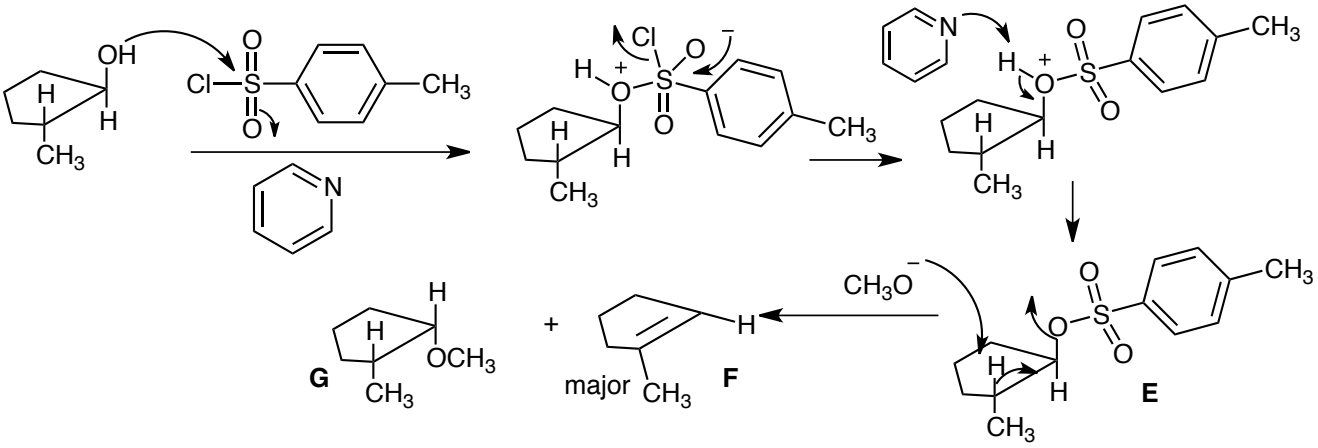


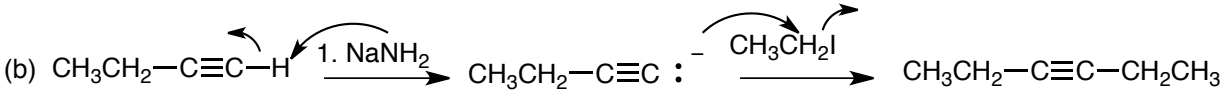
Here, one stereocenter is the same configuration, the other is the opposite; therefre these are non-superimposable, non-mirror images and they are diastereomers.

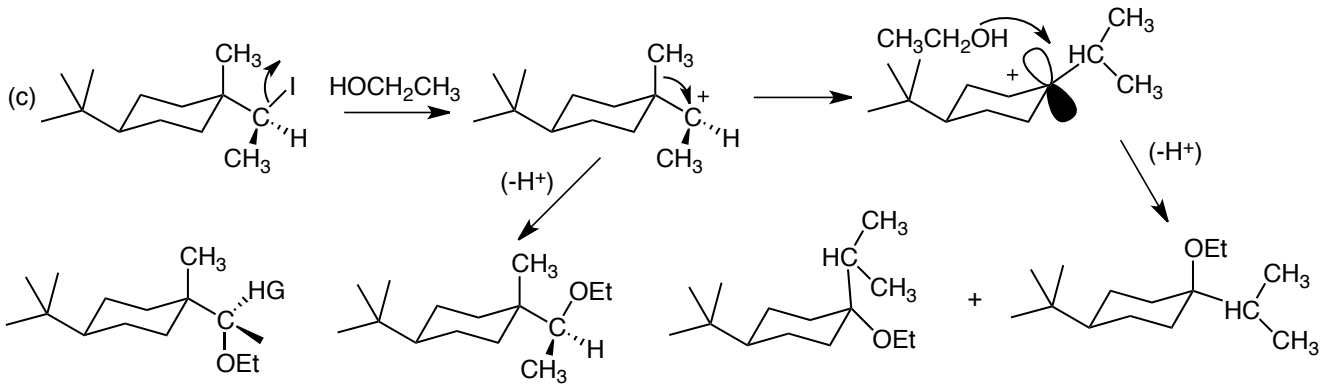


These are different molecules entirely

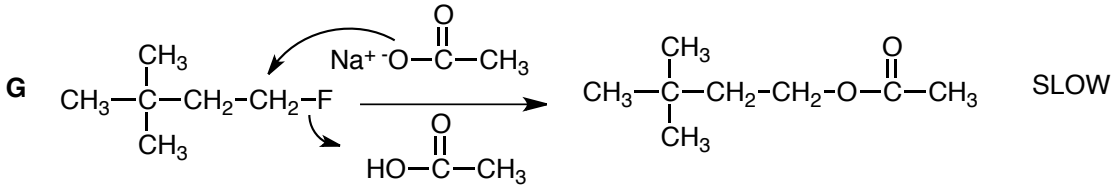
3. Give the product for each of the following reactions and show the complete reaction mechanism by which it is formed. If there is more than one product formed, be sure to indicate this and specific which is the major and minor product. (40 pts)

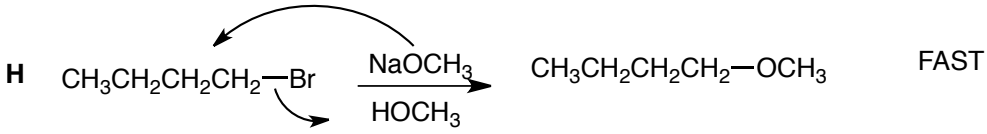






4. (a) Give the product(s) of the following two reactions, showing the complete reaction mechanism in each case and (b) then indicate which reaction would proceed faster. Explain your answer considering **ALL** factors that would influence the relative rates of the two reactions. (15 pts)





(b) **H** is faster because (i) the methoxide is a better nucleophile than the carboxylate (ii) the substrate is less hindered in **H** (iii) bromide is a better leaving group than fluoride. The effect of the solvents are about the same. Recall that S_N2 reactions are accelerated by using polar aprotic solvents like DMSO but here reactions take place in polar protic solvents.

5. Synthesize **TWO** of the following **THREE** molecules. Do all three for extra credit. (20 pts)