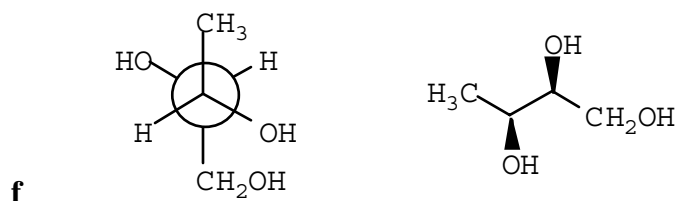
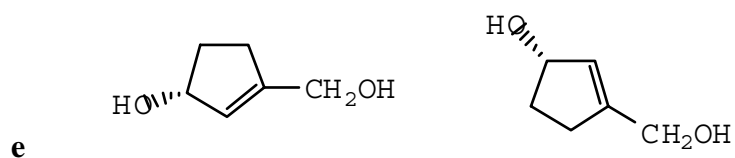
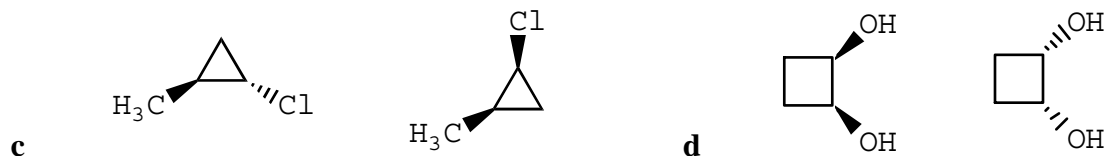
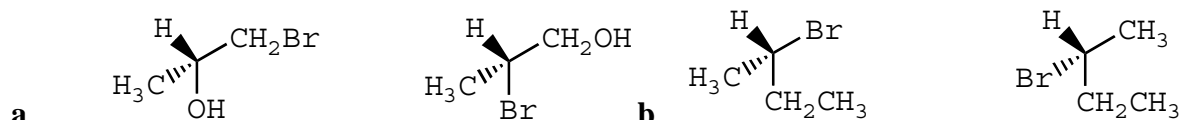
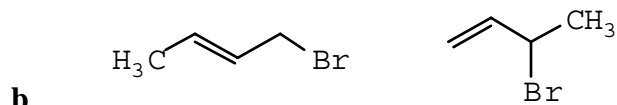
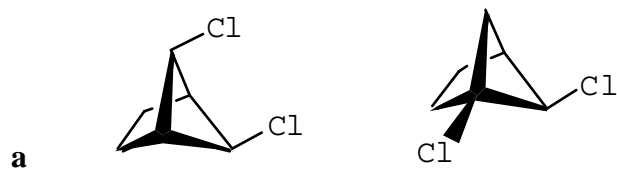


- 1 Indicate whether each pair of structures represents (1) constitutional isomers, (2) stereoisomers, (3) neither constitutional isomers nor stereoisomers, or (4) different ways of drawing the same molecule. If a pair represents stereoisomers, indicate whether they are (1) enantiomers or (2) diastereomers.

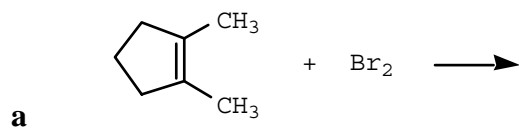


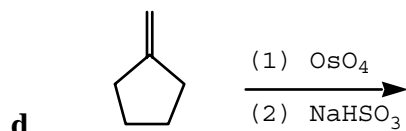
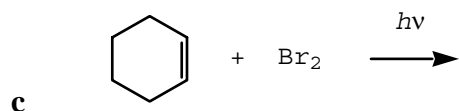
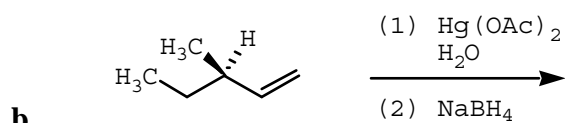
- 2 One structure in each pair is chiral whereas the other is achiral. Circle the chiral structure.



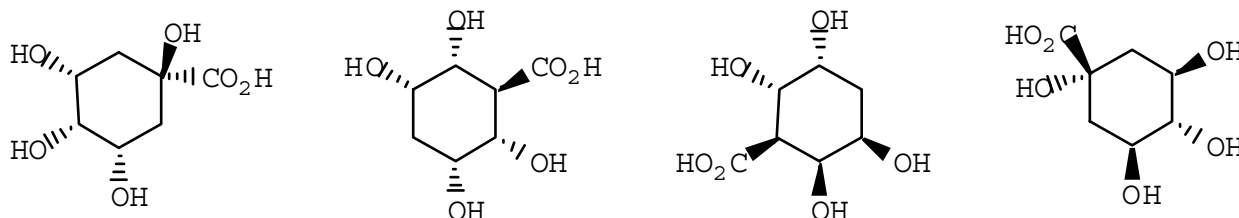
- c 1,2-dibromo-3-chloropropane      1,3-dibromo-2-chloropropane

- 3 Predict the product(s) of these reactions and characterize the product(s) as either (1) a single compound, (2) a mixture of enantiomers, or (3) a mixture of diastereomers.

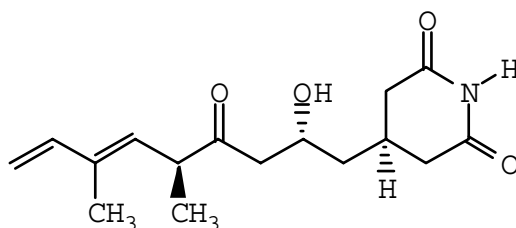




- 4** Four structures have been proposed for a naturally occurring compound having  $[\alpha]_D = +40.3^\circ$ . Which of the structures below is most likely to be correct? Briefly explain the reason for your selection.

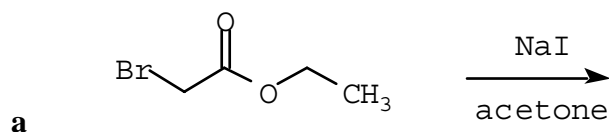


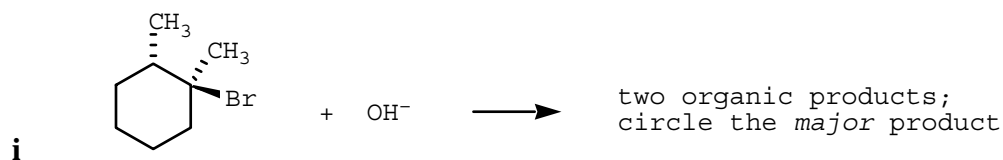
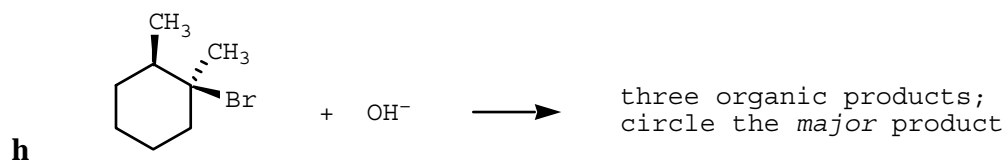
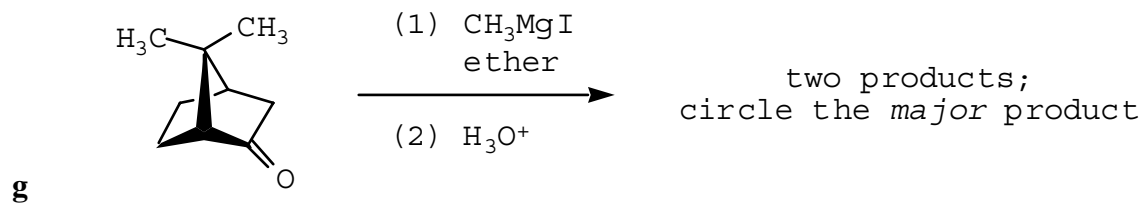
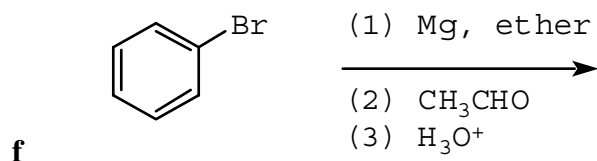
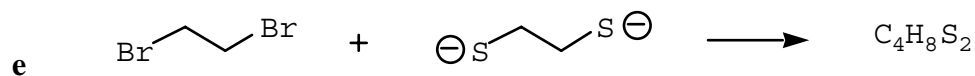
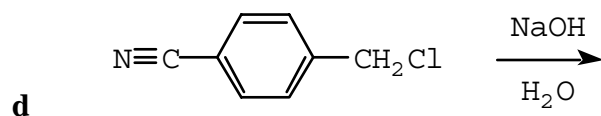
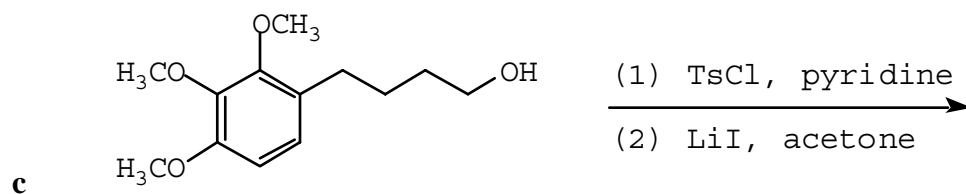
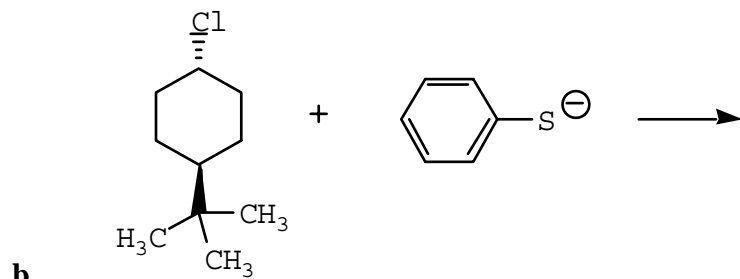
- 5** Indicate the absolute configuration (*R* or *S*) of all the stereogenic centers in the antibiotic *streptimidone*.



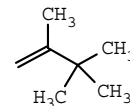
Streptimidone

- 6** Draw the structure of the major organic product of these reactions, clearly showing the product's stereochemistry where appropriate.

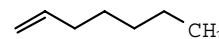




- 7 2,3,3-Trimethyl-1-butene and 1-heptene were subjected to allylic bromination with *N*-bromosuccinimide (NBS). One alkene yielded a single allylic bromide, whereas the other gave a mixture of two allylic bromide constitutional isomers.



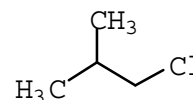
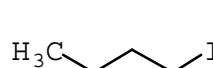
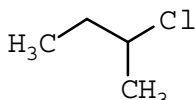
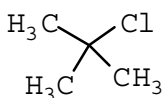
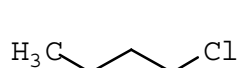
2,3,3-trimethyl-1-butene



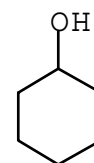
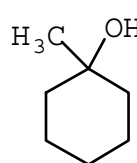
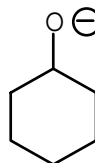
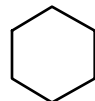
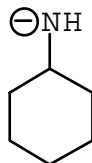
1-heptene

- a Match the chemical behavior to the correct alkene.  
 b Draw the structure of the allylic bromide(s) formed in each reaction.

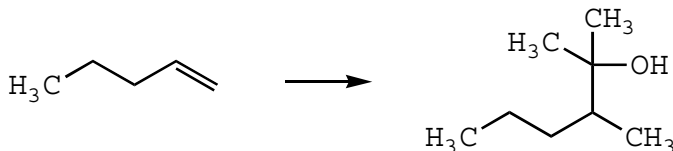
- 8 Rank each set of compounds  
 a by the rate at which each compound undergoes the  $S_N2$  reaction (1 = fastest)



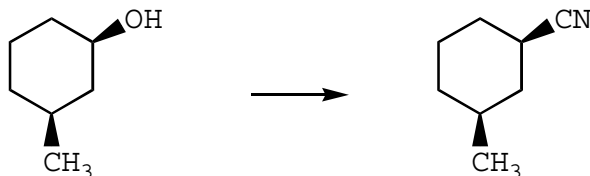
- b by nucleophilic ability in protic solvent (1 = best nucleophile)



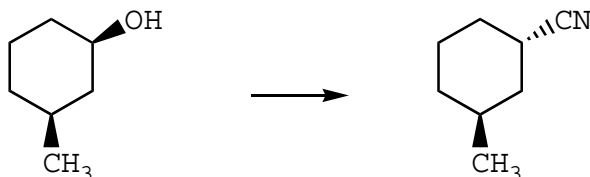
- 9 Propose a short sequence of reactions that efficiently transforms each starting material into the indicated target molecule. You may use any reagent. Draw the structure of the organic product formed after each step. Do not write mechanisms.



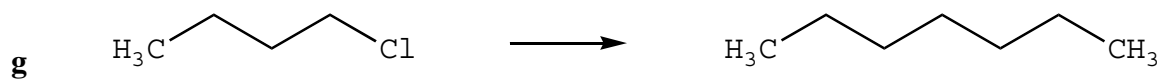
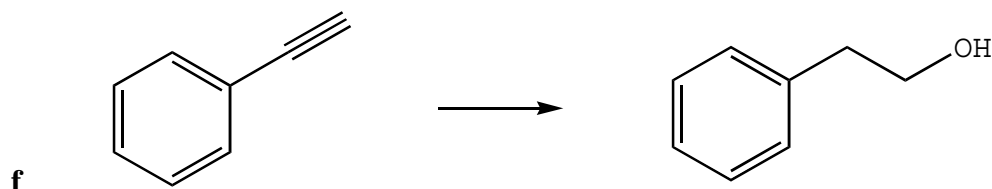
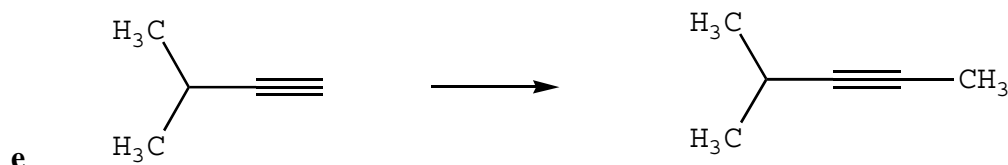
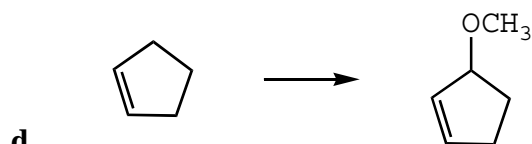
a



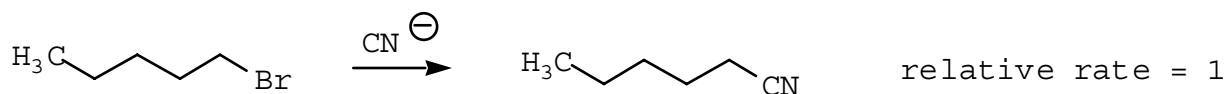
b



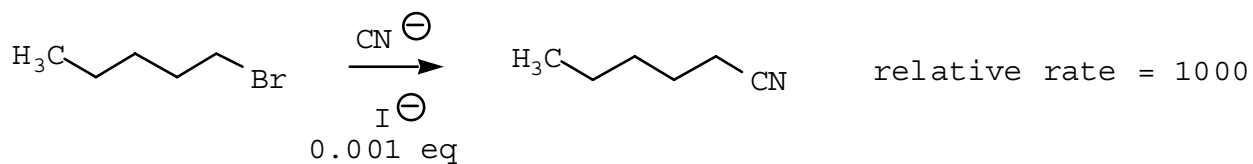
c



**10** 1-Bromopentane reacts with cyanide ( $\text{CN}^-$ ) to afford hexanenitrile:



It is found that the addition of a small (0.001 equivalent) amount of iodide ( $\text{I}^-$ ) to the reaction mixture increases the rate of the reaction by three orders magnitude:



Write an electron-pushing mechanism that explains how the addition of  $\text{I}^-$  increases the rate of the reaction.