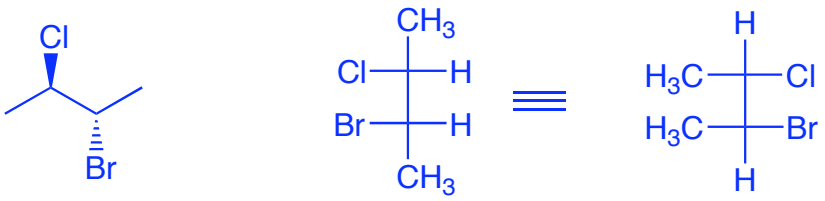
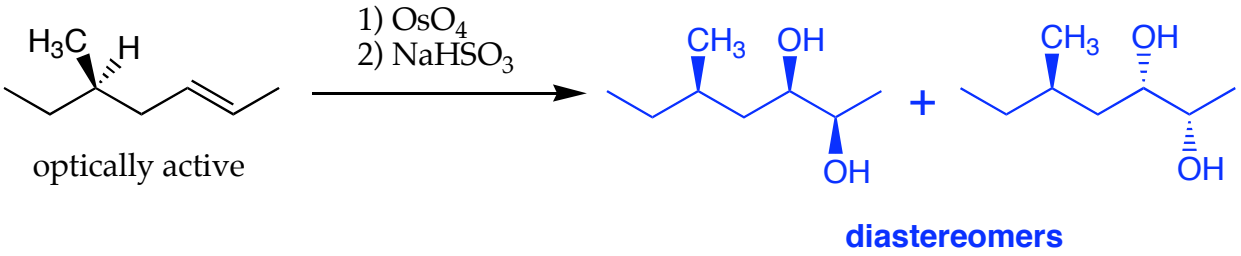
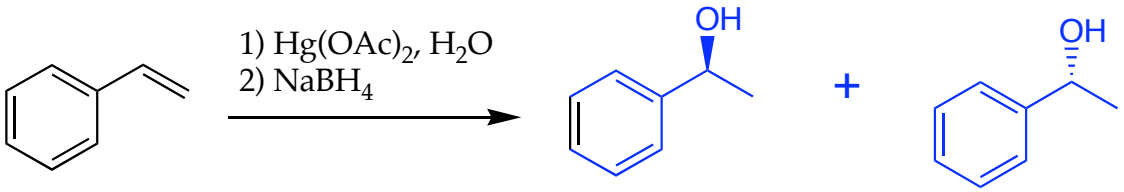
1. Draw a line structure of (2R,3S)-2-chloro-3-bromobutane. Draw a Fisher projection of the same molecule. (4 pts)



2. Draw all possible stereoisomeric products for the following reactions. What is the stereochemical relationship of the products? (8 pts)



diastereomers

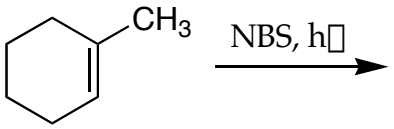


enantiomers

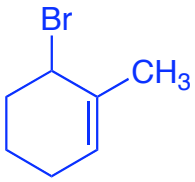
3. 0.100 Grams of an optically active substance with a molecular weight of 500 was dissolved in 10 mL of methanol. The optical rotation of the sample was measured at 589 nm (the D-line of a sodium lamp) and 25 °C through a 1 dm pathlength and determined to be - 0.50. Calculate the specific rotation of the substance. Give the proper symbol for the specific rotation under these conditions. (5 pts)

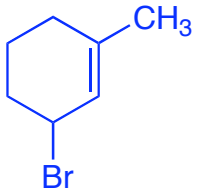
$$[\alpha]_D^{25} = \frac{\alpha}{c \cdot l} = \frac{-0.50}{(0.100/10) \cdot (1)} = -50$$

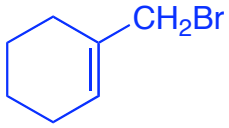
4. Give the product(s) for the following reaction. (8 pts)

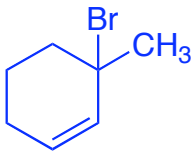


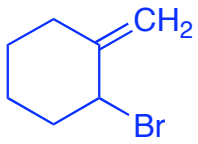
give all products

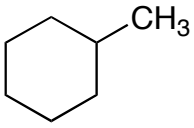




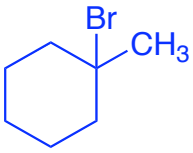








Give the major product



Problem 1:_____ (4 pts)

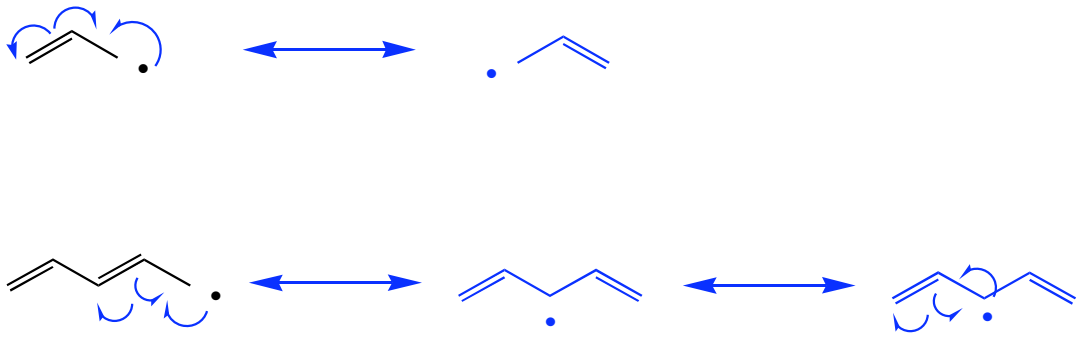
2:_____ (8 pts)

3:_____ (5 pts)

4:_____ (8 pts)

Total out of 25: _____

1. Provide all possible resonance structures for the allyl and pentadienyl radicals shown below. Use curved arrows to show the interconversion of the resonance structures (9 pts).



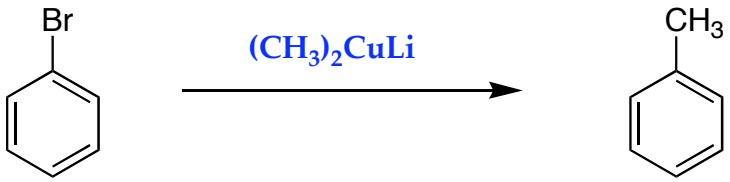
2. The bond dissociation energies of the indicated primary C-H bonds of propene and 1,3-pentadiene are given below. Briefly explain why the □H° for the 1,3-pentadiene C-H bond less than that for propene. (4 pts)

□H°= 365 KJ/mol □H°= 354 KJ/mol

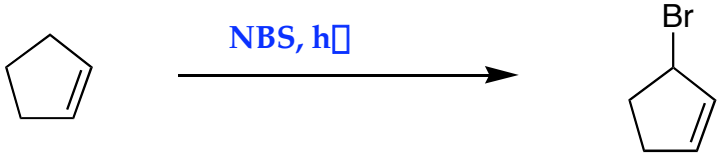
Homolytic bond dissociation gives the allyl radical and the petadienyl radical (see problem above). The pentadienyl radical has more resonance structures and is therefore more stable than the allyl radical. The DH° is a reflection of the stablility of the resulting radical that results from homolytical dissociation of the bond.

3. Provide the reagents for the following transformations.(4 pts)

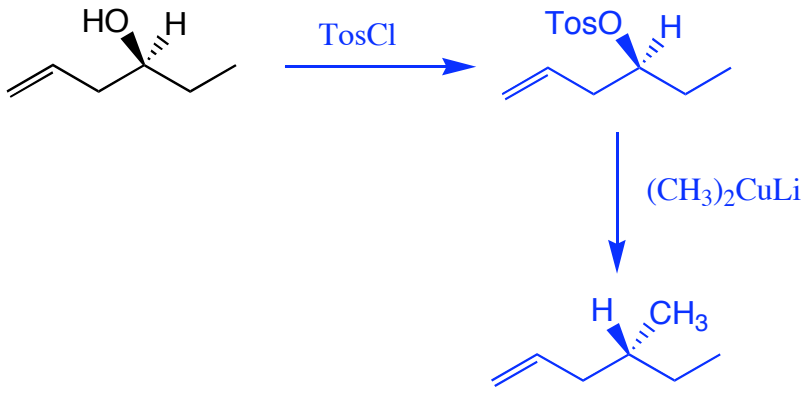
a)



b)

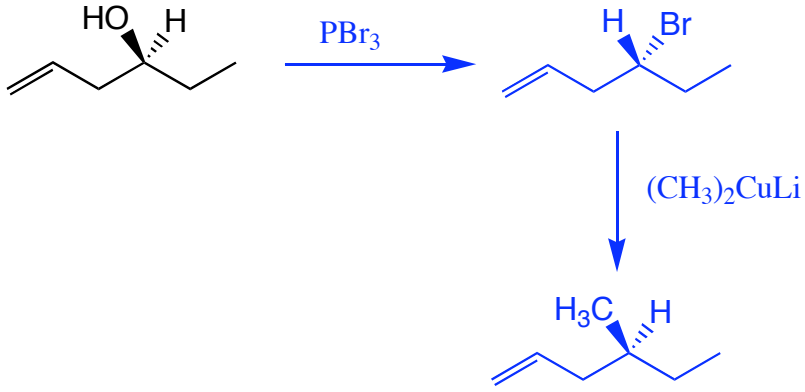


4. a) Starting with the optically active alcohol shown below and any necessary reagents, devise the best possible synthesis of (R)-4-methyl-1-hexene. (4 pts)



(R)-4-methyl-1-hexene

b) Starting with the optically active alcohol shown below and any necessary reagents, devise the best possible synthesis of (S)-4-methyl-1-hexene. (4 pts)



(S)-4-methyl-1-hexene

Problem 1:_____ (9 pts) 2:_____ (4 pts)

3:_____ (4 pts) 4:_____ (8 pts)

Total out of 25: _____