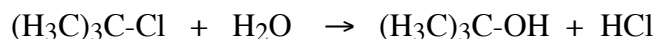
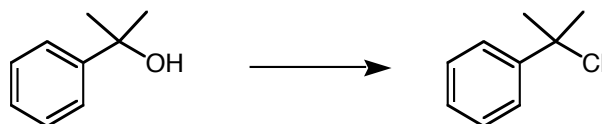


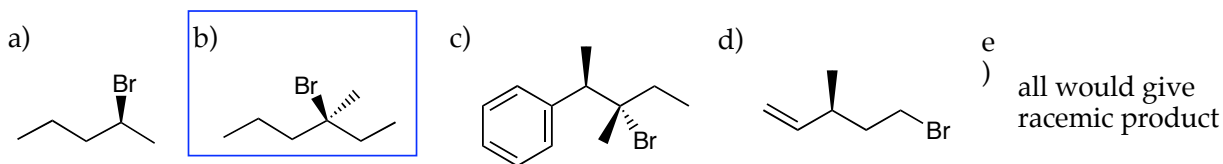
1. Which of the following solvents would be best for the reaction of 2-chloro-2-methylpropane with water to give 2-methyl-2-propanol ?



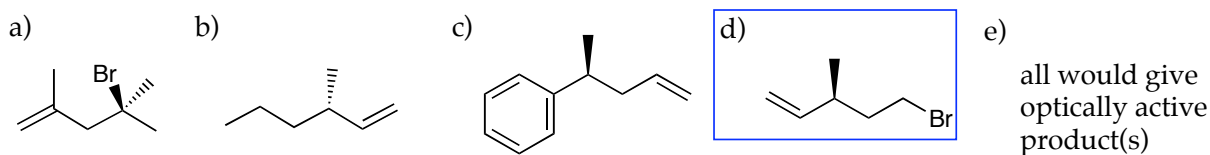
- (a) dimethylsulfoxide ( $\text{H}_3\text{CS(O)CH}_3$ )  
 (b) hexane  
 (c) methyl alcohol ( $\text{H}_3\text{COH}$ )  
 (d) carbon tetrachloride ( $\text{CCl}_4$ )  
 (e) all would work equally well
2. Which of the following reagents could be used for the following transformation?



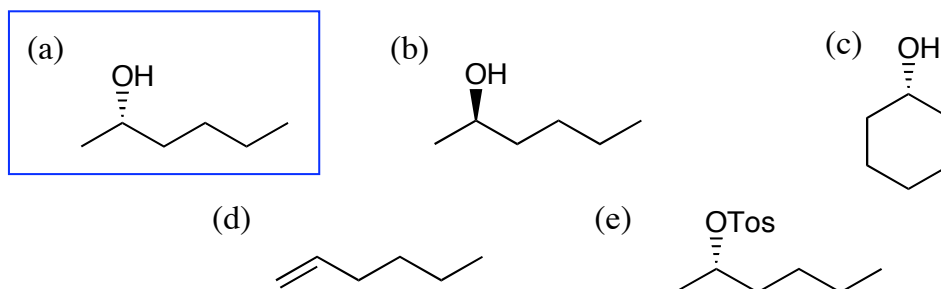
- (a) HCl and peroxides  
 (b) HCl  
 (c)  $\text{Cl}_2$  and light  
 (d)  $\text{SOCl}_2$   
 (e) NBS and light
3. All of the compounds below are optically active. Which would undergo nucleophilic substitution with hydroxide to give a racemic product?



4. All of the compounds below are optically active. Which would undergo reaction with HBr in the presence of peroxides to give an optically inactive product?

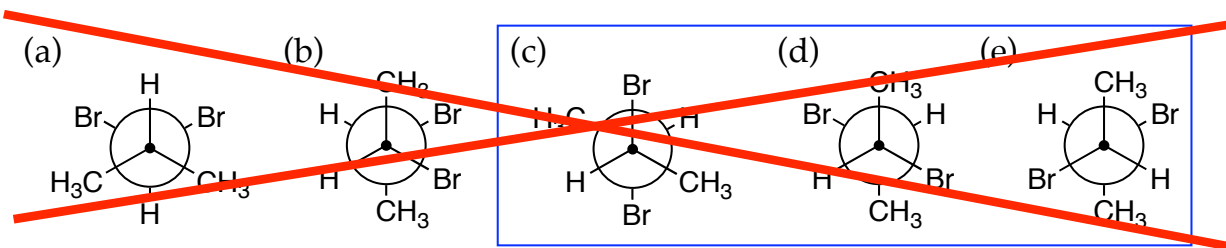


5. (R)-2-bromohexane can be obtained by the reaction of  $\text{PBr}_3$  with which of the following compounds?



6. Which of the following is the Newman projection for meso-2,3-dibromobutane?

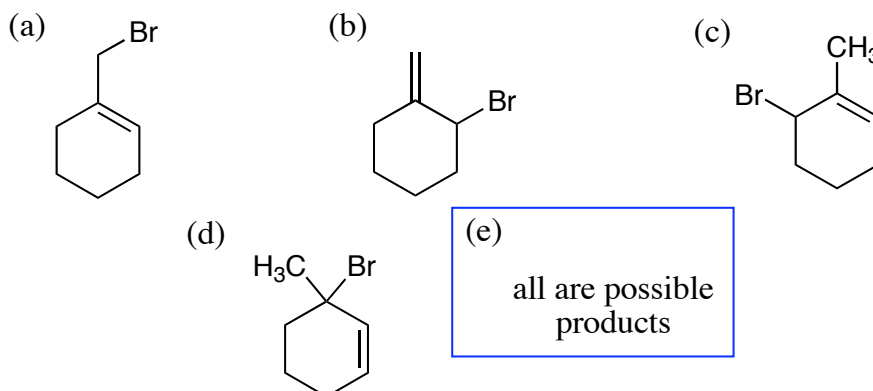
**BAD PROBLEM**



7. Which of the following molecules has a mirror image isomer?

- (a) 1,3-dichloropentane  
 (b) 1,5-dichloropentane  
 (c) 3-chloropentane  
 (d) 2-chloro-1-pentene  
 (e) all of the above have a mirror image isomer

8. Which of the following is not a possible product from the reaction of 1-methylcyclohexene with NBS and light?



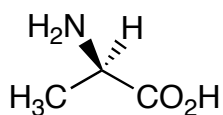
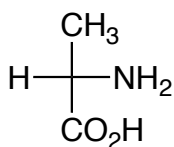
9. 1-Bromocyclohexene can be converted to 1-methylcyclohexene by the reaction with which of the following reagents?

- (a)  $\text{H}_3\text{C-Li}$   
 (b)  $\text{H}_3\text{C-Mg}$   
 (c)  $(\text{H}_3\text{C})_2\text{CuLi}$   
 (d)  $\text{H}_3\text{C-Br}$   
 (e) Acetylene and  $\text{H}_2\text{N}^-$

10. An unknown organic compound has a mass of 113. In the mass spectra, the molecular ion peak (M) has an relative abundance of 50%; the relative abundance of the M+1 peak is 2.7%. How many carbons does the unknown compound have?

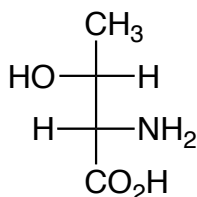
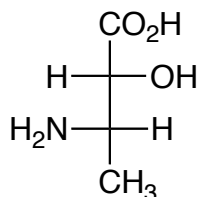
- (a) 4  
 (b) 5  
 (c) 6  
 (d) 8  
 (e) there is insufficient information to answer the question

11. a. Consider the following pairs of compounds. Are the compounds constitutional isomers, enantiomers, diastereomers or identical? (12 pts)



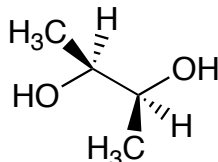
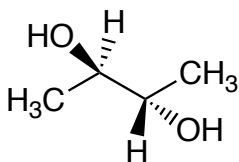
**enantiomers**

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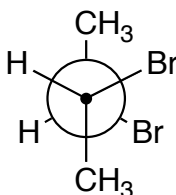
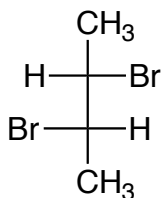
**constitutional**

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**diastereomers**

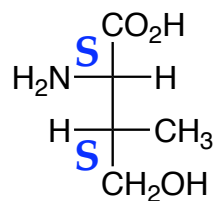
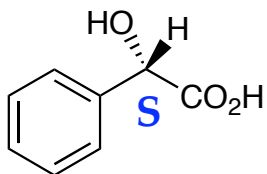
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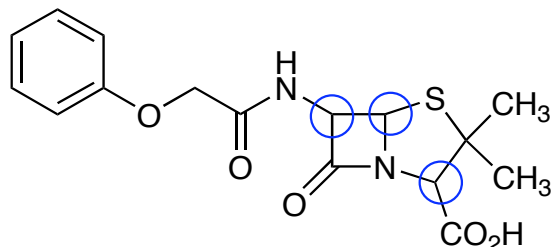
**enantiomers**

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- b. Assign the configuration of each stereogenic center for the compounds shown below. (6 pts)



12. a. The compound shown below is penicillin V. Mark the stereogenic centers of penicillin V with an asterisk. (6 pts)

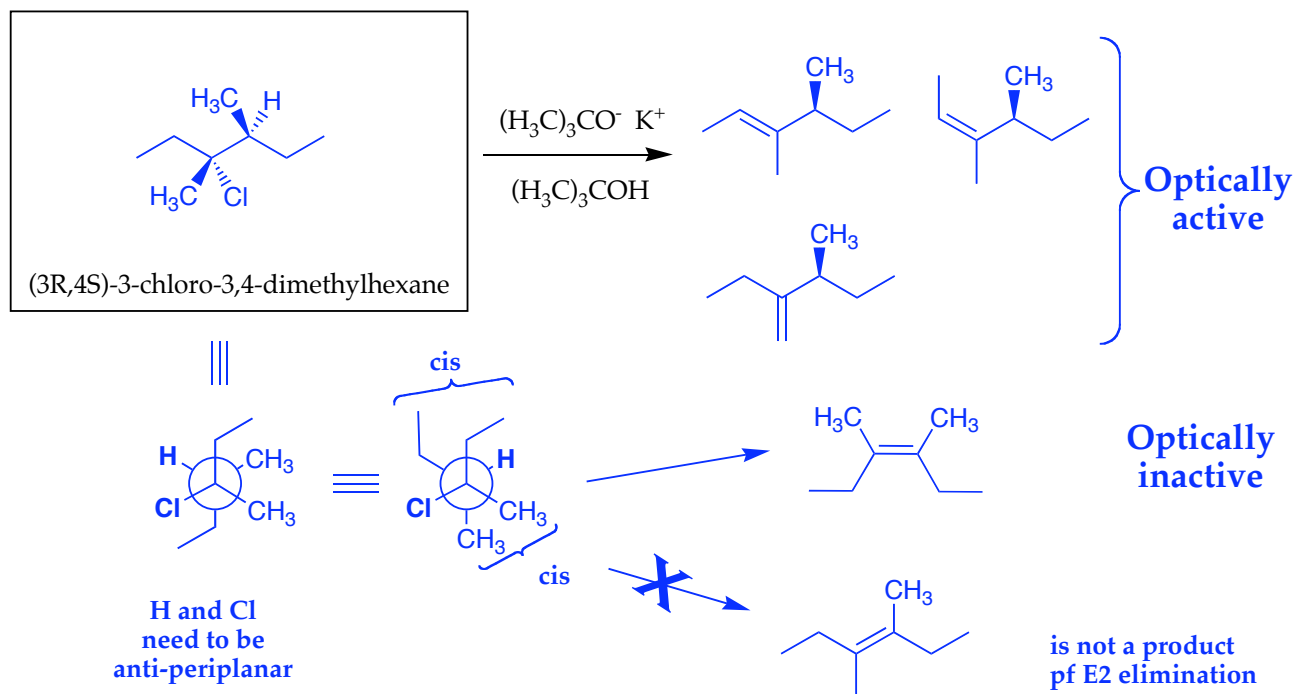


- b. How many stereoisomers of penicillin V are possible? (2 pts)

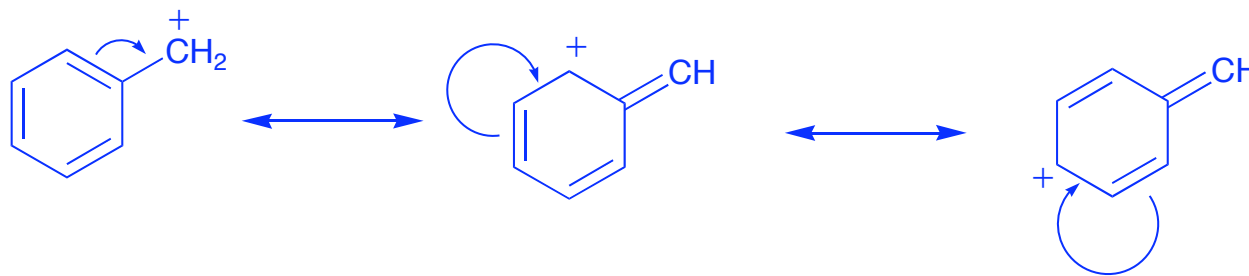
$$2^3 = 8$$

13. (3R,4S)-3-Chloro-3,4-dimethylhexane undergoes reaction with potassium t-butoxide,  $(\text{H}_3\text{C})_3\text{CO}^- \text{K}^+$ , to give four possible products.

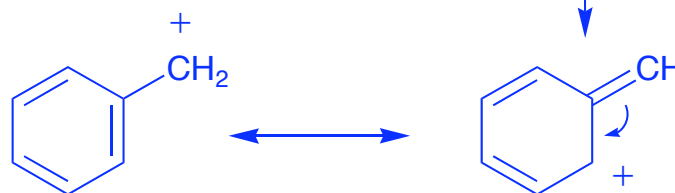
- Clearly draw the starting material and the four possible products of the reaction. Be sure to indicate stereochemistry if relevant.
- For each product, indicate if it is optically active or optically inactive.
- Which would be the major product according to Zaitsev's rule. (14 pts)



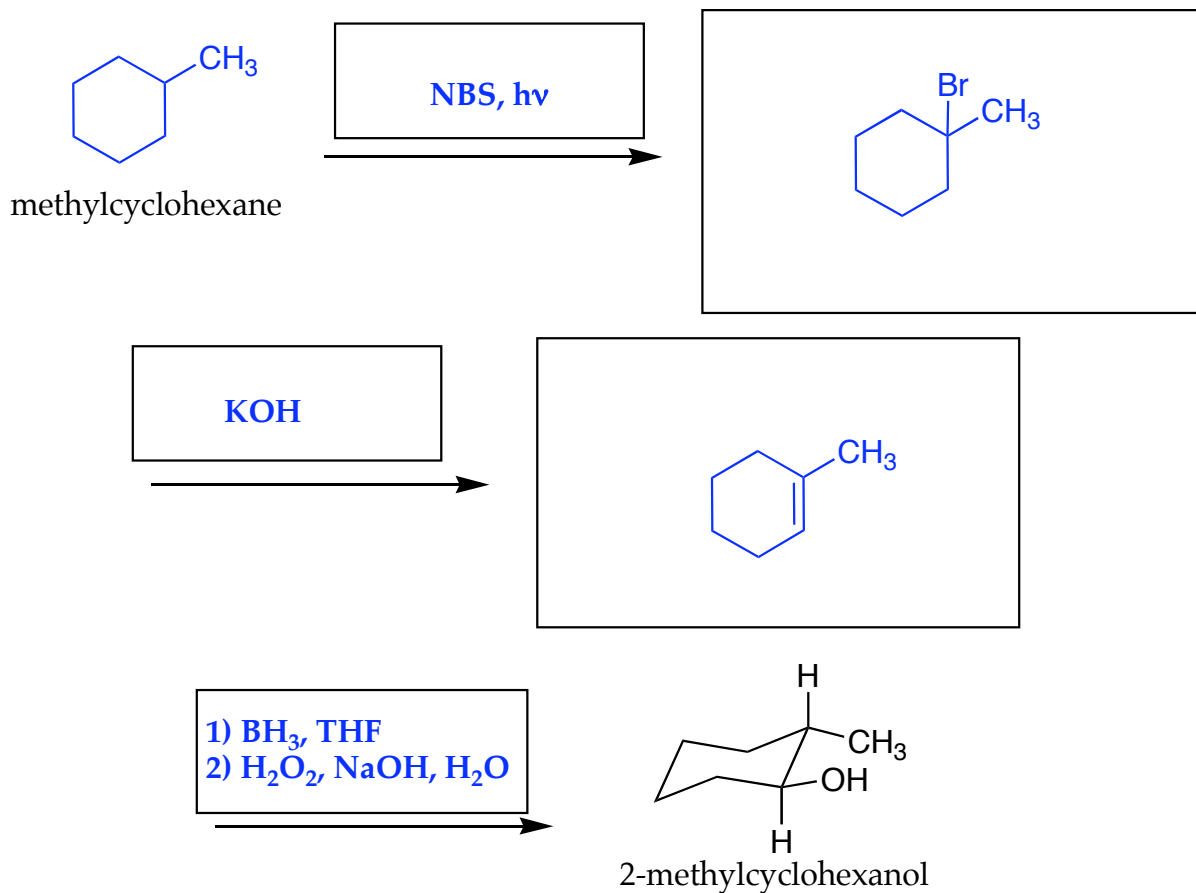
14. Draw all possible resonance structures of the benzylic carbocation. Draw mechanistic arrows showing how the resonance structure can interconvert. (10 pts)



note: all are double headed arrows



15. Starting from methyl cyclohexane and any necessary reagents, synthesize trans-2-methylcyclohexanol in the space provided below. (10 pts)



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Problem            1-10: \_\_\_\_\_ (40 pts)

11: \_\_\_\_\_ (18 pts)

12: \_\_\_\_\_ (8 pts)

13: \_\_\_\_\_ (14 pts)

14: \_\_\_\_\_ (10 pts)

15: \_\_\_\_\_ (10 pts)

Total out of 100: \_\_\_\_\_