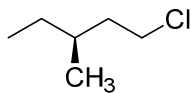


Name: _____

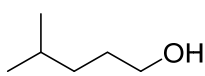
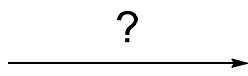
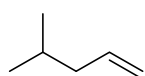
Select the correct solution for each multiple-choice question. (2 points each)

1. Identify the correct IUPAC name for the following structure.

- a. (S)-5-chloro-3-methylpentane
 b. (R)- 2-ethyl-4-chlorobutane
 c. (S)-1-chloro-3-methylpentane
 d. (R)- 1-chloro-3-methylpentane



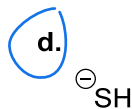
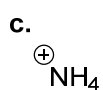
2. Circle the reagents required for the given reaction.



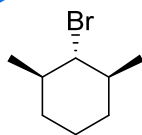
a. NaOH, heat

c. 1. $\text{BH}_3 \cdot \text{THF}$
 2. NaOH, H_2O_2

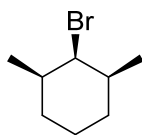
b. 1. $\text{Hg}(\text{OAc})_2$, H_2O
 2. NaBH_4

d. OsO_4 , NMO3. Circle the reagent which would react fastest in an $\text{S}_\text{N}2$ reaction.4. Circle the compound that **cannot** undergo an $\text{E}2$ elimination.

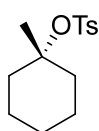
a.



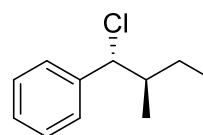
b.



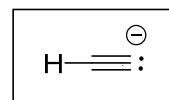
c.



d.



5. Classify the nucleophilicity and basicity of the following reagent:



a.

Strong Base
 Strong Nucleophile

b.

Strong Base
 Weak Nucleophile

c.

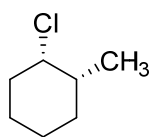
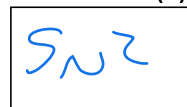
Weak Base
 Strong Nucleophile

d.

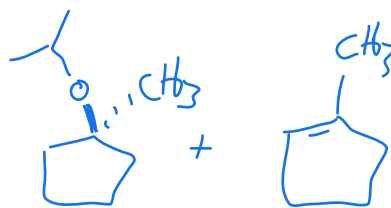
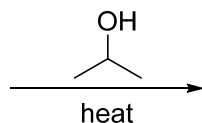
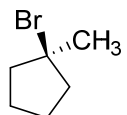
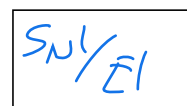
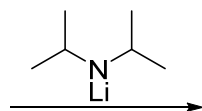
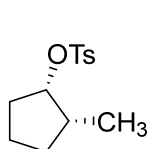
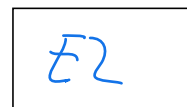
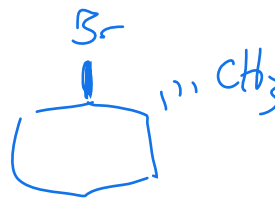
Weak Base
 Weak Nucleophile

6. a. Predict the mechanism(s) for following reactions. If you do not expect a reaction to occur write "no rxn".
 b. Provide the expected major product(s). If there is one than one possible mechanism, draw the expected **major** product for **each** mechanism. (9 points)

Mechanism(s):

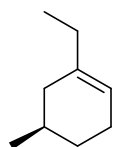


NaBr



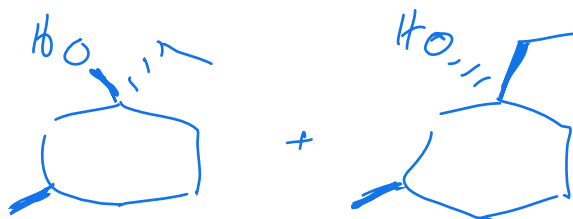
7. Provide the product for the following reactions. Be sure to **clearly indicate stereochemistry** where appropriate. You do not need to draw mechanisms for these problems. (8 points)

a.

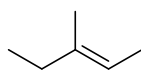


1. $\text{Hg}(\text{OAc})_2, \text{H}_2\text{O}$

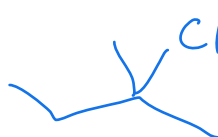
2. NaBH_4



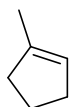
b.



HCl



c.

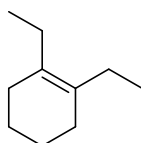


1. O_3

2. DMS

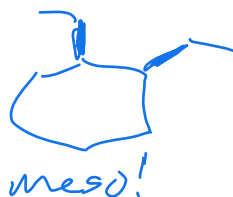


d.

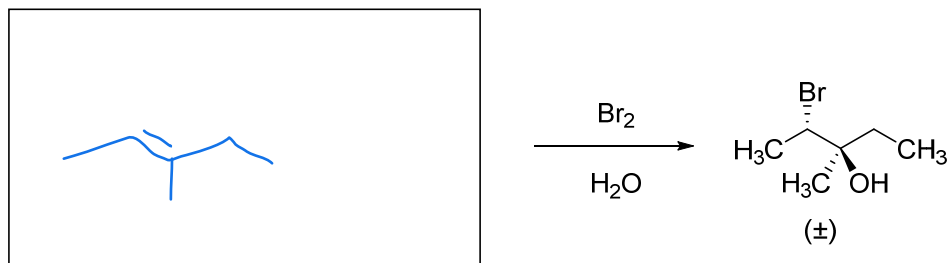
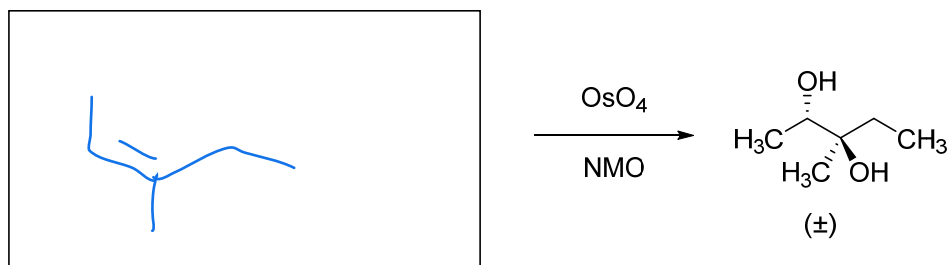


H_2

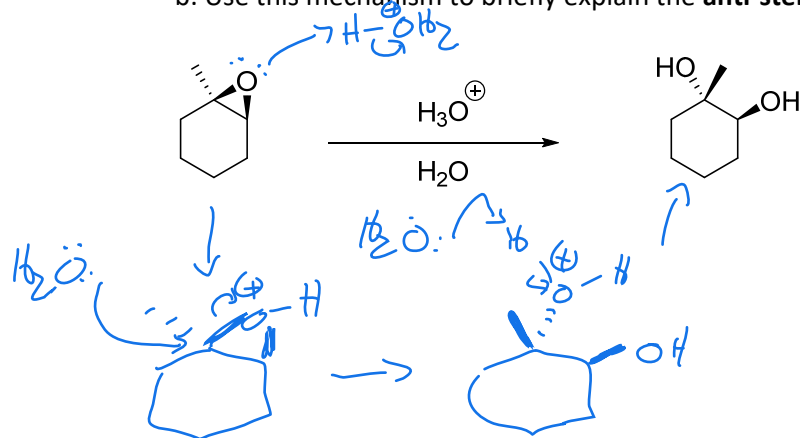
Pd/C



8. Provide the starting material for the following reactions. Be sure to **clearly indicate stereochemistry**. (4 points)

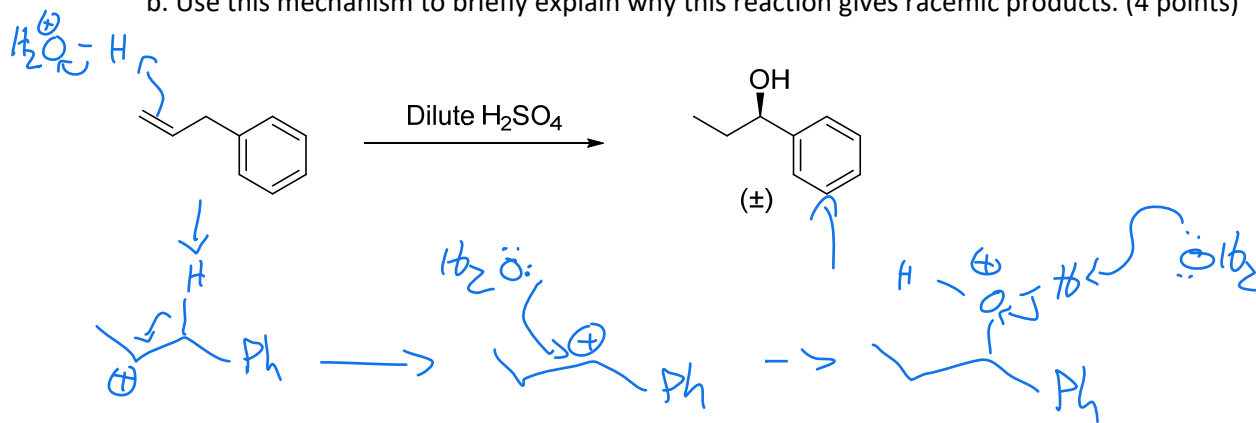


9. a. Draw a mechanism to account for the following reaction.
b. Use this mechanism to briefly explain the **anti-stereoselectivity**. (4 points)



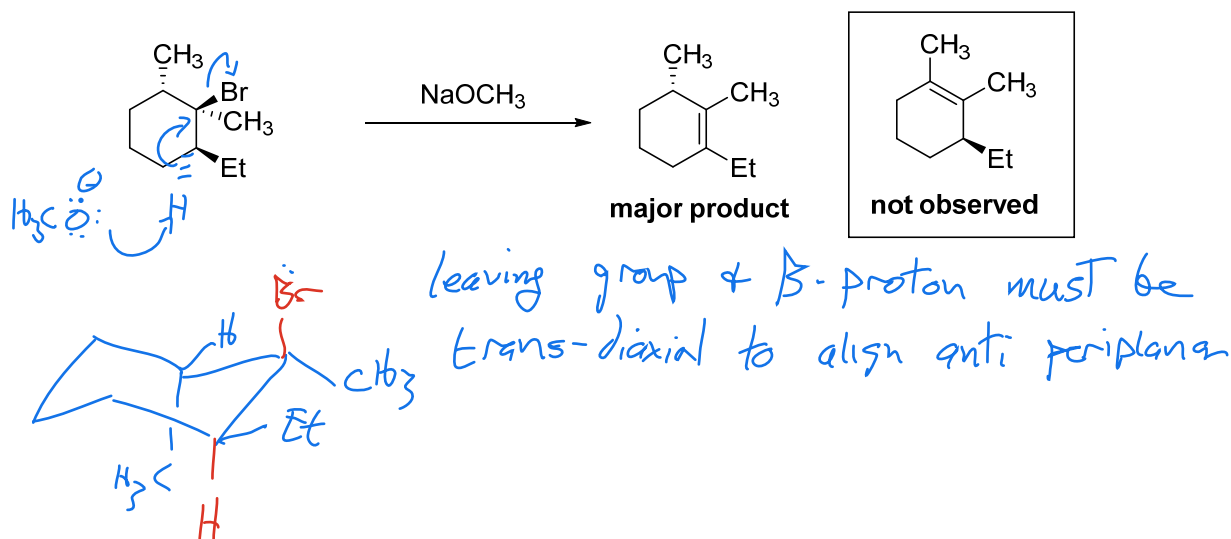
SN2-like opening of protonated epoxide leads to anti products

10. a. Draw a mechanism to account for the following reaction.
b. Use this mechanism to briefly explain why this reaction gives racemic products. (4 points)



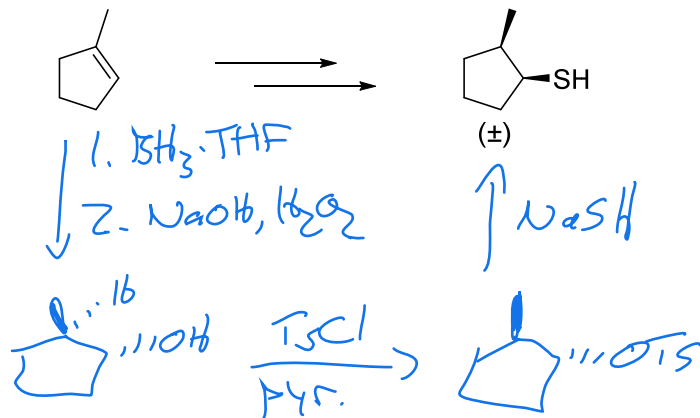
H_2O attacks planar C^+ from both sides

11. a. Use a **chair drawing** to explain the **regioselectivity** observed in the reaction below.
 b. Draw an arrow pushing mechanism which accounts for the major product as part of your explanation.
 (6 points)

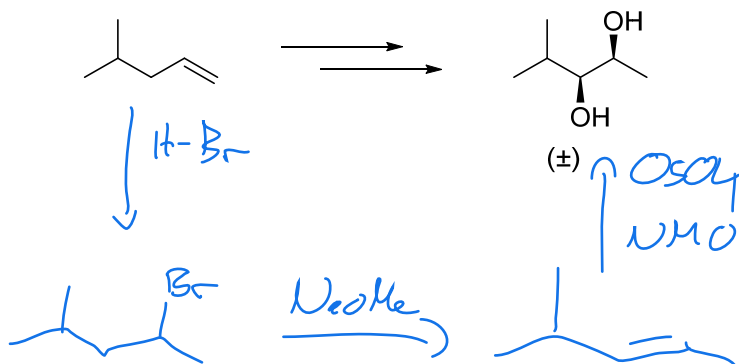


12. Provide synthesis for the following transformations. You do not need to draw mechanisms for these problems.
 (8 points)

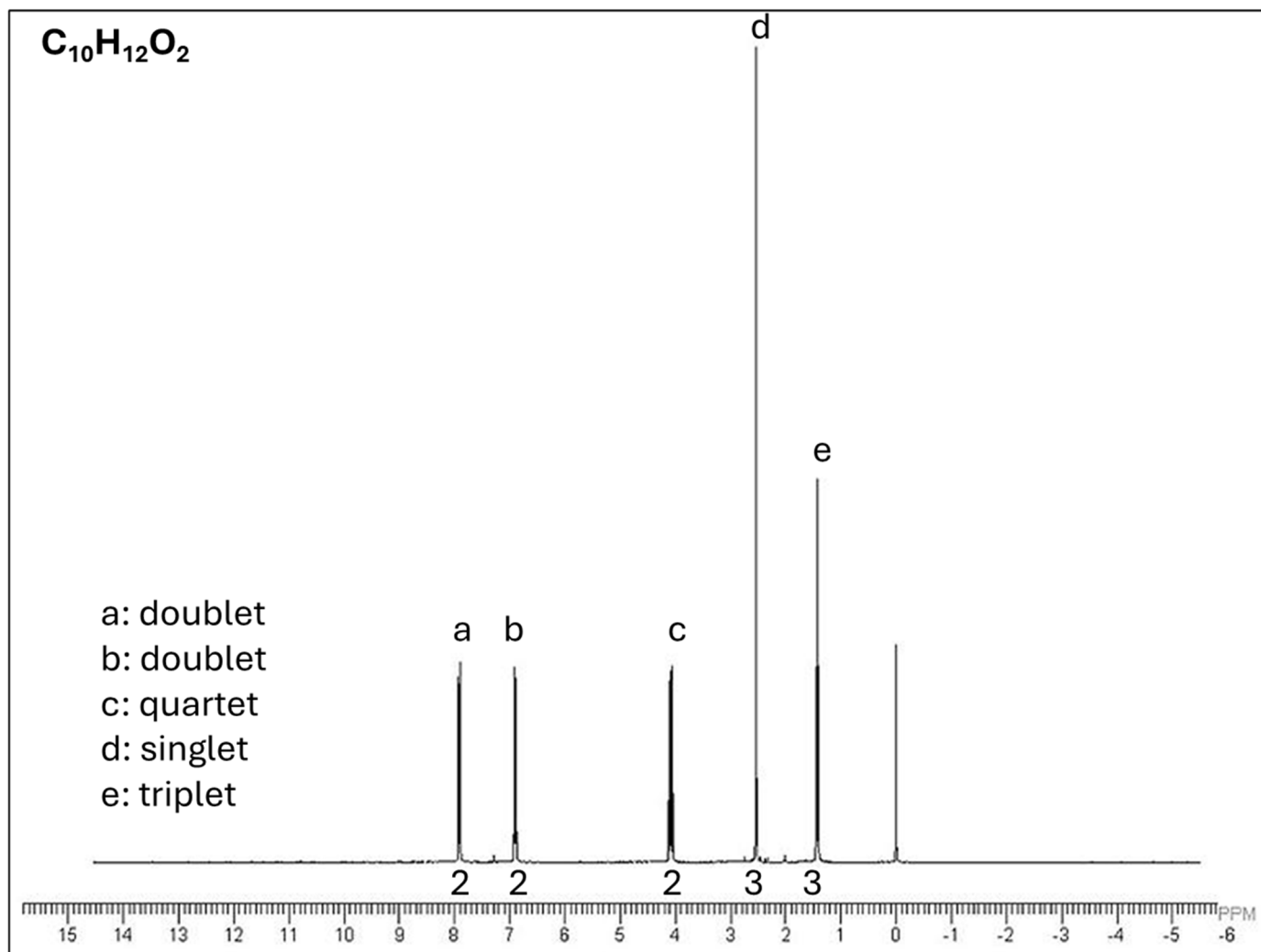
a.



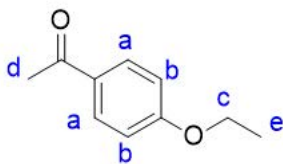
b.



13. Propose a structure based on the ^1H NMR spectrum below. Clearly label each set of protons on your proposed structure (a,b,c,...). The molecular formula is $\text{C}_{10}\text{H}_{12}\text{O}_2$ and possible functional groups include alcohol, aromatic, ether, aldehyde, and ketone. (5 points)



Correct structure:



Also accepted:

