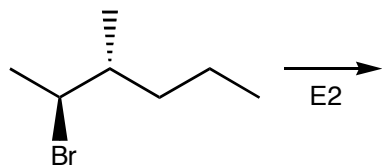


1. (4 pts. each) Draw the internal alkenes that can be produced in the following reactions.

1. \_\_\_\_\_

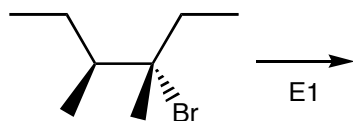
a.



2. \_\_\_\_\_

3. \_\_\_\_\_

b.



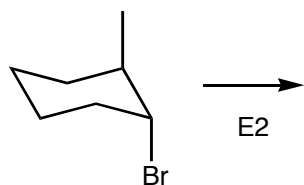
4. \_\_\_\_\_

5. \_\_\_\_\_

2. (4 pts. each) Draw the internal alkenes that can be produced in the following reactions.

6. \_\_\_\_\_

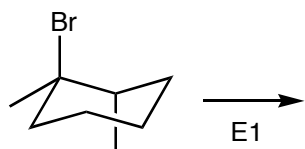
a.



7. \_\_\_\_\_

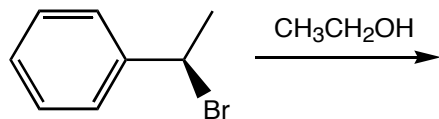
8. \_\_\_\_\_

b.

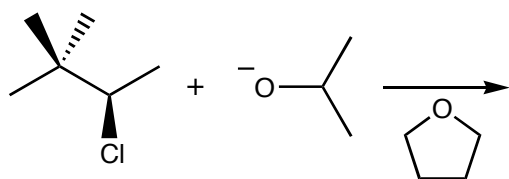


3. (6 pts. each) For the following reactions, indicate the type of reaction that will occur (S<sub>N</sub>1, S<sub>N</sub>2, E2, E1) and predict the product(s) of the reaction.

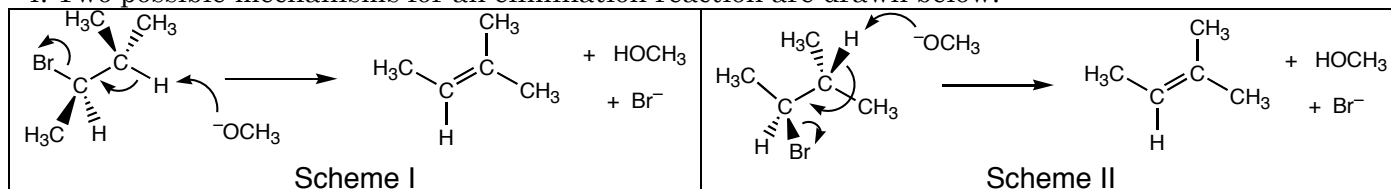
a.



b.



4. Two possible mechanisms for an elimination reaction are drawn below.

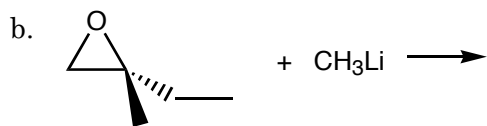
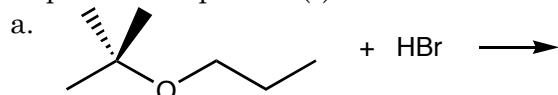


a. (4 pts.) Are these schemes representations of E1 or E2 reactions?

b. (5 pts.) Which mechanism is the better representation for an E2 reaction? Explain.

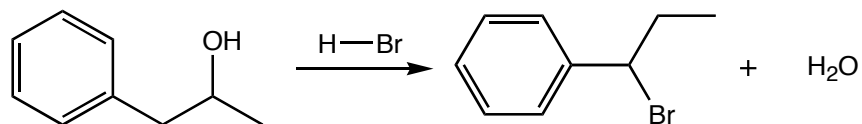
c. (3 pts.) To form the  $\pi$  bond between the two carbon atoms electrons are required. Where do those electrons come from?

5. (6 pts. each) For the following reactions, indicate the mechanism that will predominate, and predict the product(s) of the reaction.

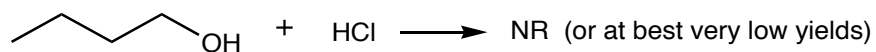


6 a. (4 pts.) By what mechanism does the following reaction occur?

b. (8 pts.) Draw a mechanism that accounts for the product in the following reaction.



7. Reactions of HCl with 1° alcohols to form 1° alkyl chlorides are not synthetically useful reactions.



a. (4 pts.) Provide a reagent that would be able to form the alkyl chloride, and (b. 6 pts.) describe why your reaction succeeds, whereas the HCl reaction fails.

8. a. (5 pts.) On the molecule drawn below, circle the methyl group that is attacked by the nucleophile during a nucleophilic substitution reaction.

b. (7 pts.) Draw the leaving group and explain why it is a good leaving group.

