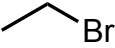
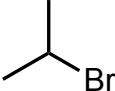
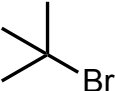
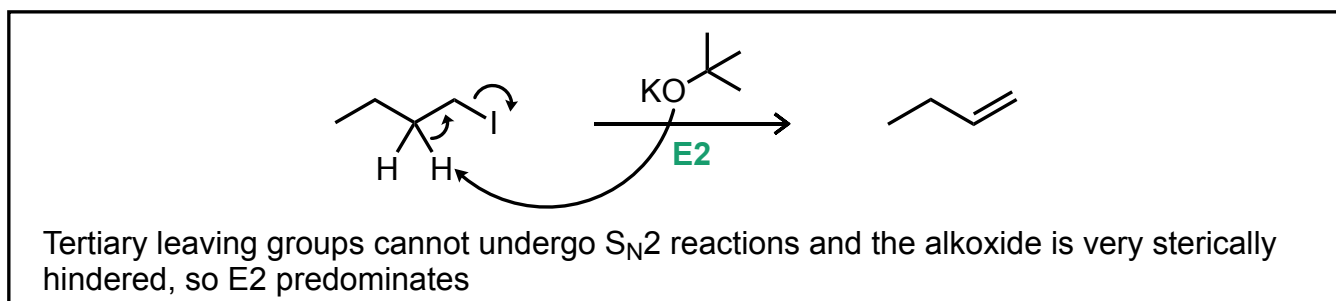
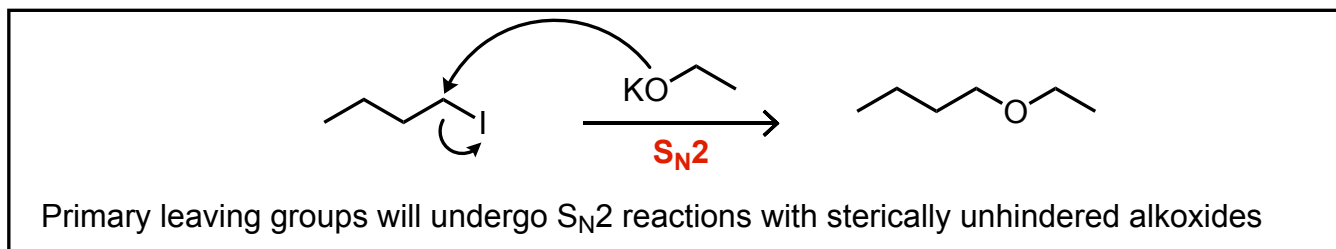


Substitution and Elimination

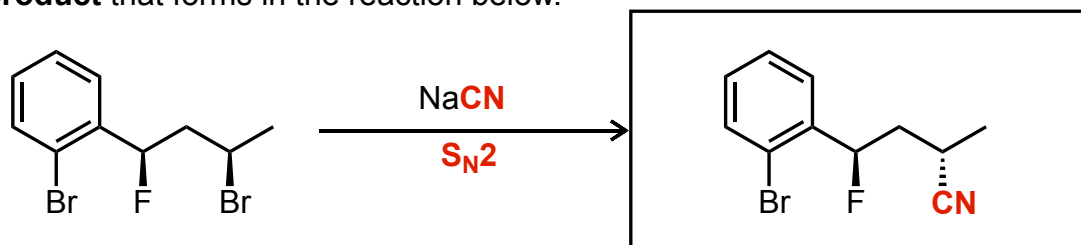
1. A. **Classify each alkyl halide** as being primary, secondary, or tertiary
- B. **Identify the weakest Lewis base and strongest Lewis base**
- C. In the boxes provided, **predict** if a **S_N2**, **E2**, or **no reaction** will proceed between each alkyl halide and Lewis base pair

		weakest Lewis base NaO-C(=O)CH ₃	NaCN	NaO-CH ₂ CH ₃	strongest Lewis base NaNH ₂
1°		S_N2	S_N2	S_N2	E2
2°		S_N2	S_N2	E2	E2
3°		no reaction	no reaction	E2	E2

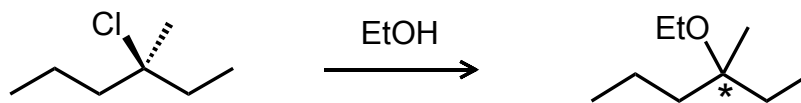
2. A. Draw the curved arrow mechanism for each reaction below.
- B. Explain why S_N2 occurs in the top reaction, but E2 occurs in the bottom reaction.



3. **Draw the product** that forms in the reaction below.



4. The reaction below is deliberately excluded from the Core Concept's flowchart. Answer the questions below to help you classify the reaction as S_N2 , E2, S_N1 , or E1.



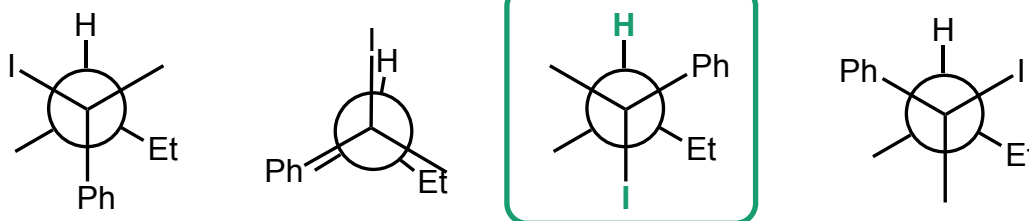
A. Do we observe inversion, retention, or racemization of chirality when comparing the product to the starting material?

B. Is this process **stepwise** or **concerted**? Consider the reagents used in stepwise reactions versus the types of Lewis bases used in concerted reactions.

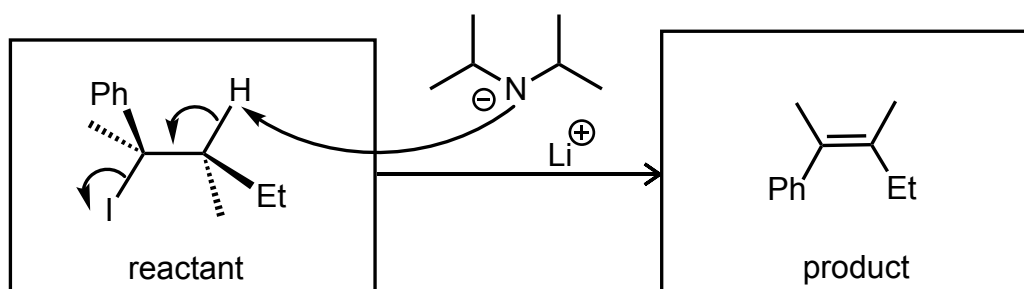
A tertiary carbocation is the key intermediate in this reaction

C. What **type of reaction** occurred above? S_N2 , E2, **S_N1** , or E1?

5. A. Shown below are various conformations of the same molecule (conformers). **Place a box around the Newman projection that is in a reactive conformation for an E2 elimination reaction.**

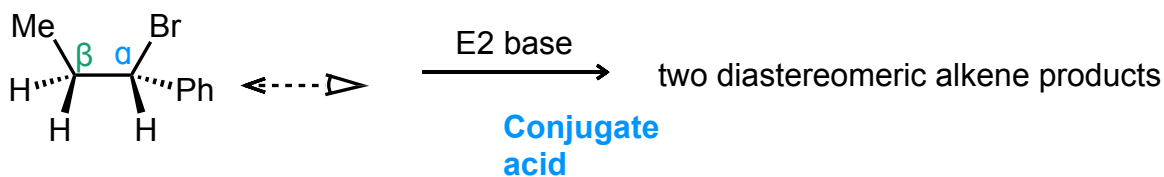


B. **Draw the bond line structure of the boxed conformation from part A** in the reactant space below. Then, show the curved-arrow mechanism and product for its subsequent E2 reaction with the shown base.

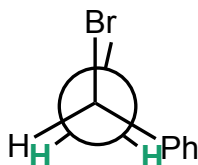


6. The alkyl halide below can participate in an **E2 reaction** in the presence of a suitable base to **yield two diastereomeric alkene products**.

A. **Label the α carbon and β carbon(s)** relative to the leaving group in the molecule below.



B. **Draw the Newman projection** of the molecule above **given the indicated perspective**.



unreactive for E2

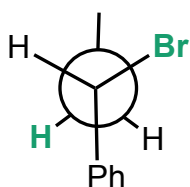
In the Newman projection you drew to the left, the **molecule is not in a reactive conformation for an E2** elimination reaction. **Why not?**

E2 reactions require an anti-periplanar relationship between the β -H and leaving group (not possible in an eclipsed conformation)

C. **Rotate the front carbon** of the Newman projection in part B **to provide two different Newman projections that are in a reactive conformation for an E2 reaction**.

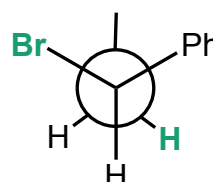
rotate front C

reactive Newman projection 1



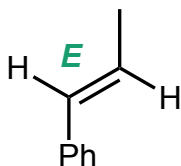
rotate front C

reactive Newman projection 2

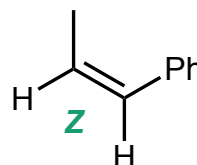


D. **Draw the alkene product** that would result from **each of the reactive Newman projections** from part C. Then **assign them as E or Z** and **circle the major product**.

product from reactive Newman projection 1

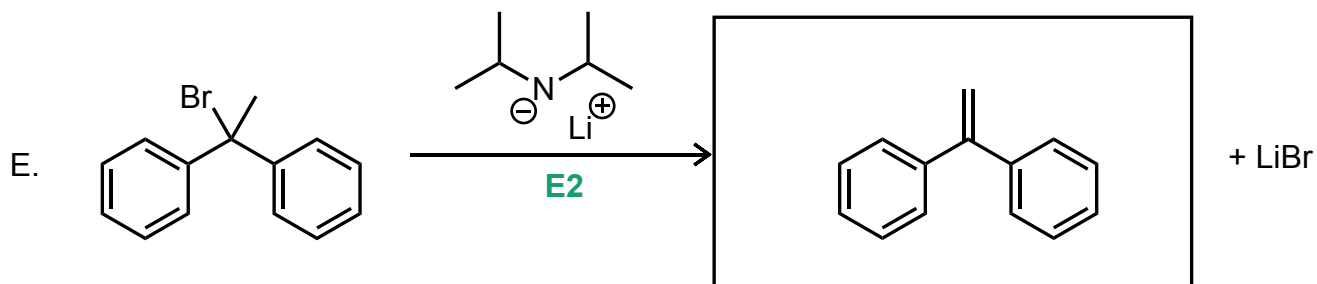
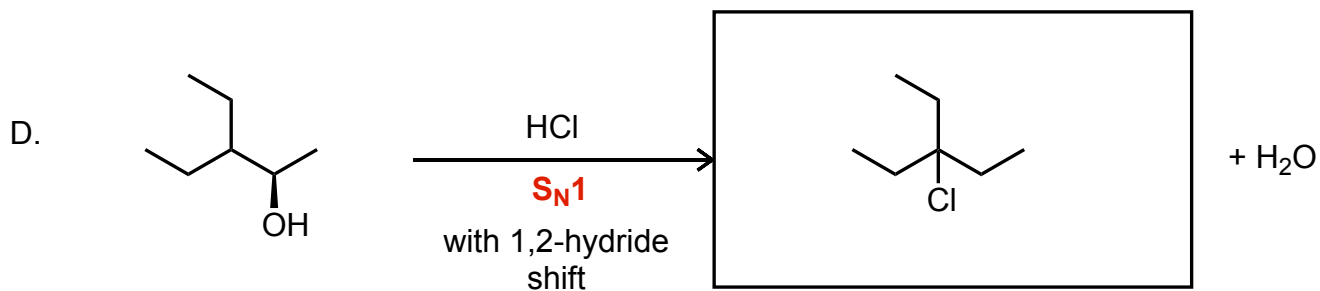
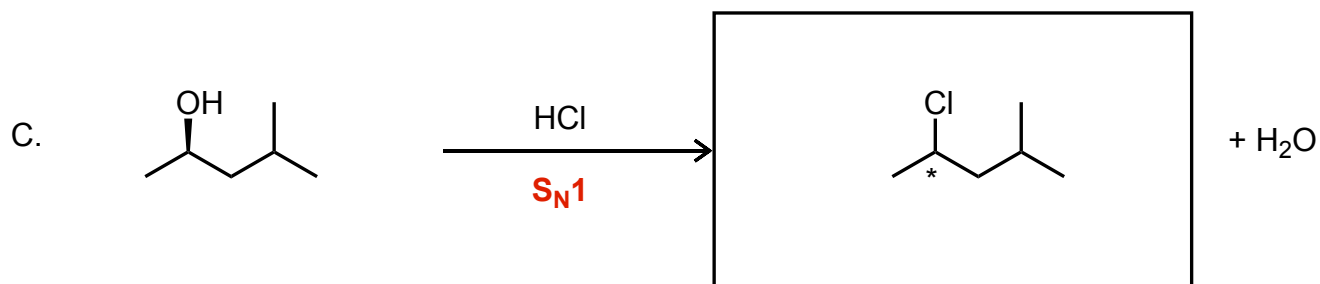
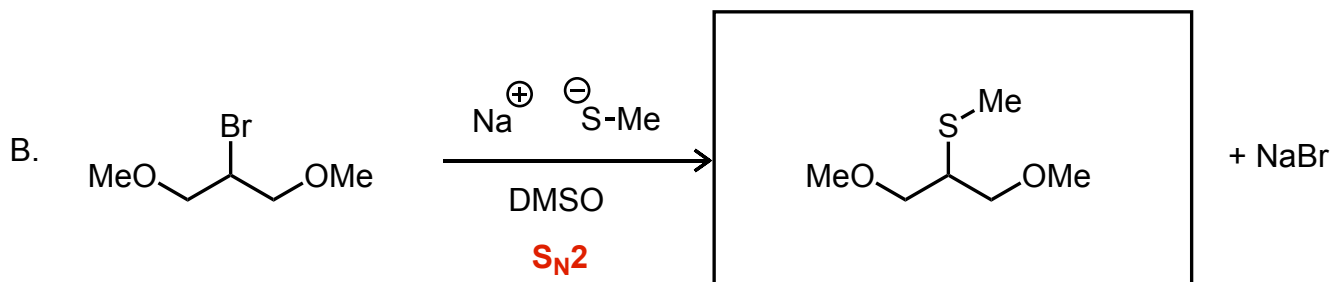


product from reactive Newman projection 2

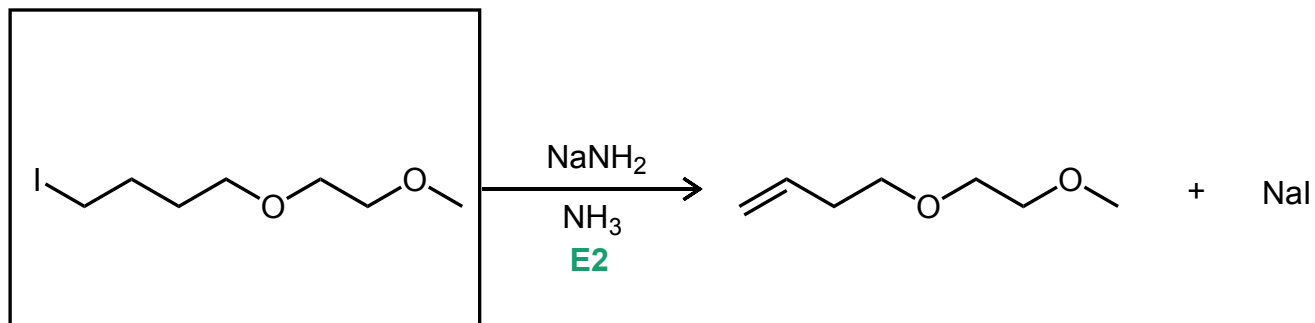


7. Identify the reaction taking place (S_N1 , S_N2 , E1, or E2). Then, provide the missing starting material, reactant, or major product.

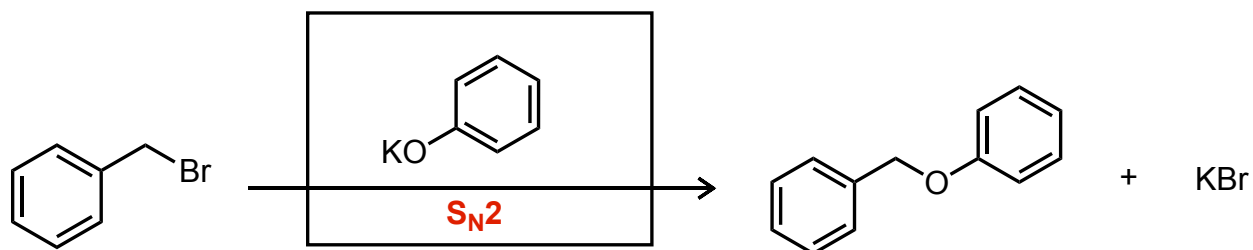
Consider that carbocation rearrangements are possible in S_N1 and E1 reactions if the shift results in a more stable carbocation.



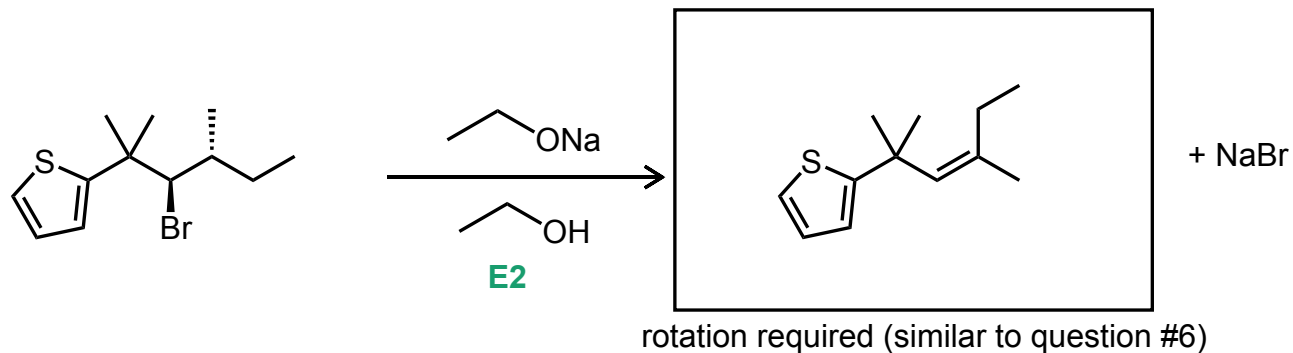
F.



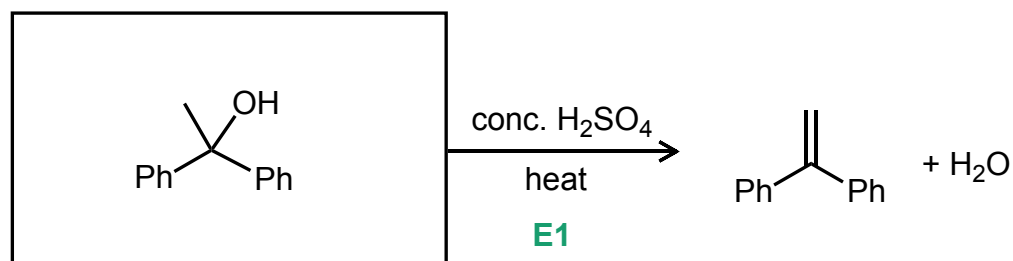
G.



H.



I.



J.

