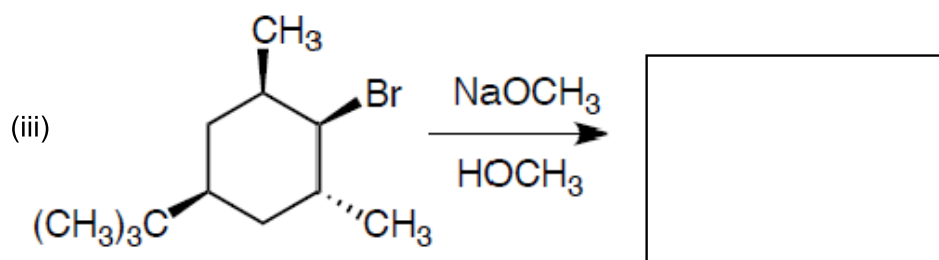
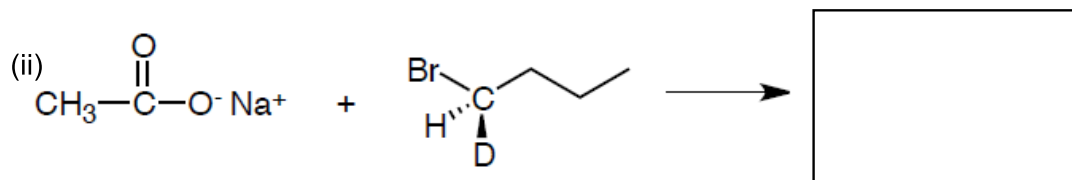
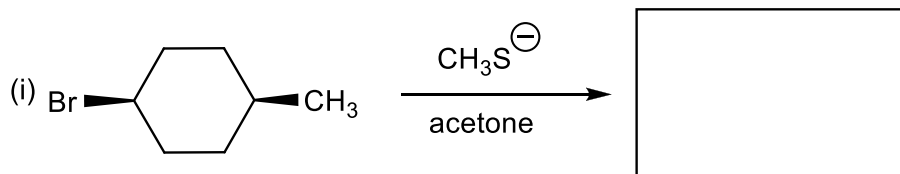

Topics covered in lectures-12, 13 to be discussed in Tutorial 5

- Nucleophilic substitution reactions: S_N^1 , S_N^2 : Basic features with examples, reaction profile, stereochemistry, factors affecting S_N^1 , S_N^2 reactions, effect of substrate, nucleophile, solvent, stability of carbocations, comparison between S_N^1 , S_N^2 .
- Elimination reactions: E1, E2, Zaitsev rule, mechanism, energy-profile, regioselectivity, factors affecting E2/E1 reactions, comparison between S_N^1/S_N^2 and E1/E2, stereochemistry of E2 reactions, E2 reactions, dehydrohalogenation in six-membered rings, E1cB reaction.

1. Rank the species below in order of increasing nucleophilicity in hydroxyl solvents: CH_3CO_2^- , CH_3S^- , HO^- , H_2O

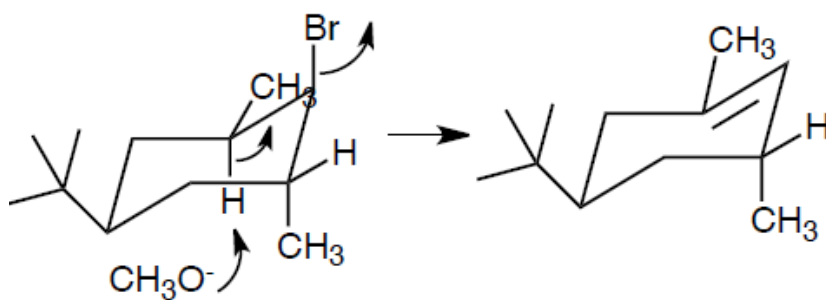
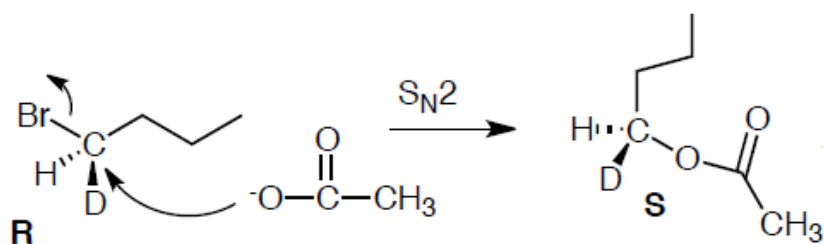
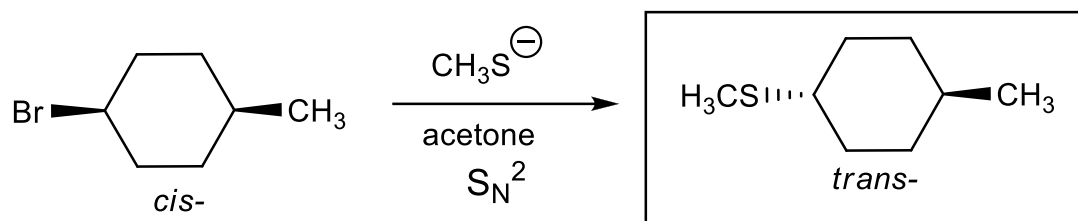
Ans: $\text{H}_2\text{O} < \text{CH}_3\text{CO}_2^- < \text{HO}^- < \text{CH}_3\text{S}^-$

2. Draw the structures of organic products formed with correct stereochemistry at the stereogenic centre (if any) in the following reactions.

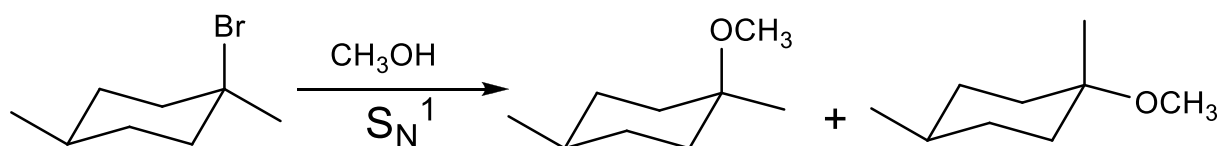


Draw the major product

Ans:

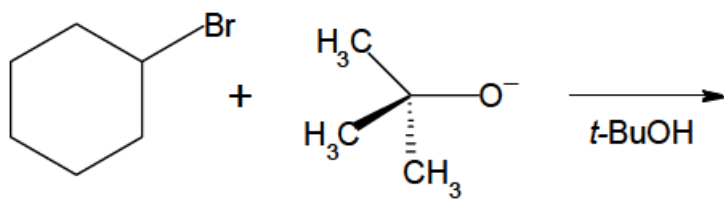


3. What product(s) would you expect from the following solvolysis reaction? Designate the type of reaction mechanism.

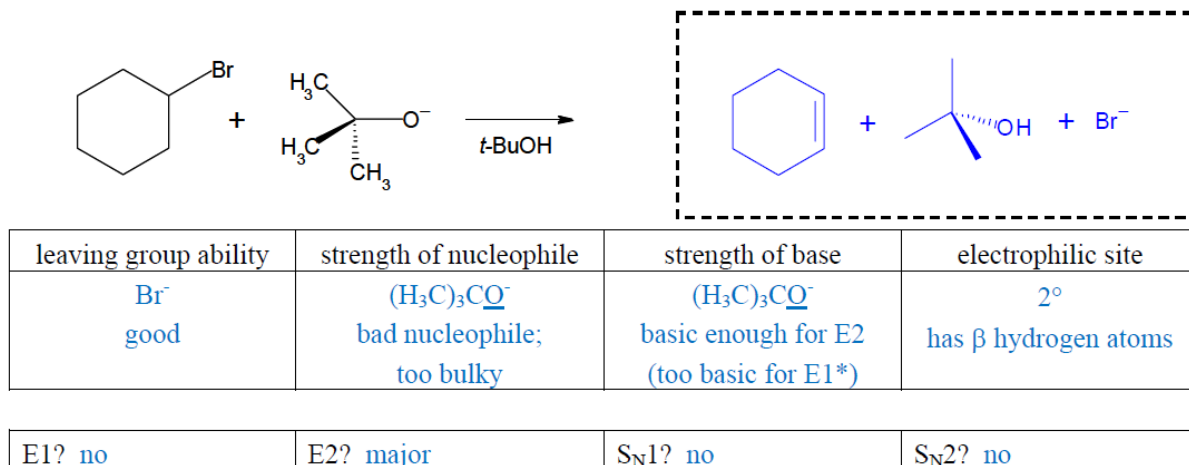


Here α -carbon is tertiary, and thus in MeOH it should lose Br^- to form tert. stable carbocation and proceed via S_N1 reaction. Planarity of carbocation leads to two products.

4. For the following reaction, draw the product(s) of the major reaction(s). Clearly indicate any relevant stereochemistry.

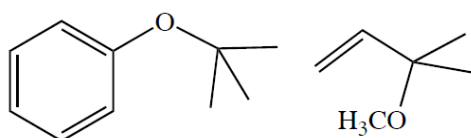


Ans with justification



*Recall that carbocations cannot be formed in the presence of basic anions.

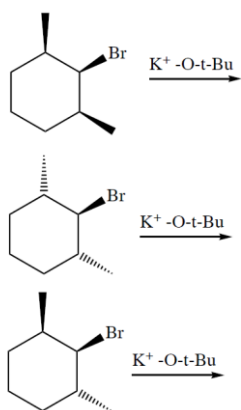
5. Deduce substrate and corresponding nucleophile to prepare following molecules using $\text{S}_{\text{N}}1$ reaction?



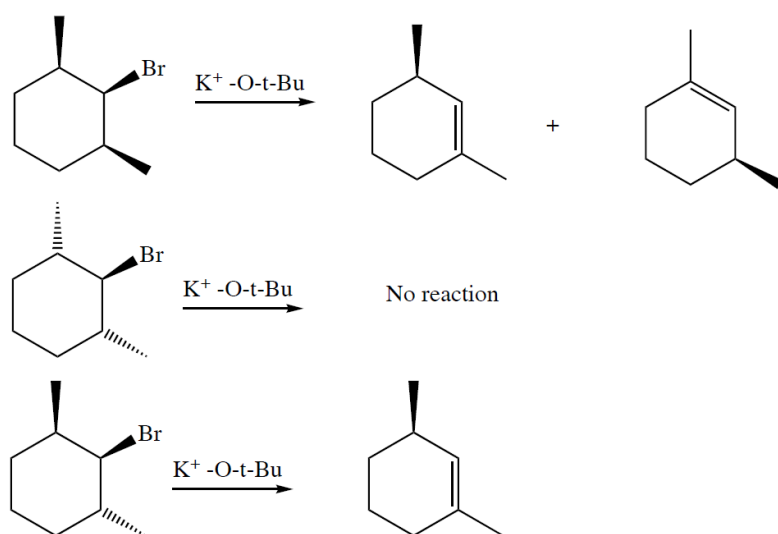
Ans:



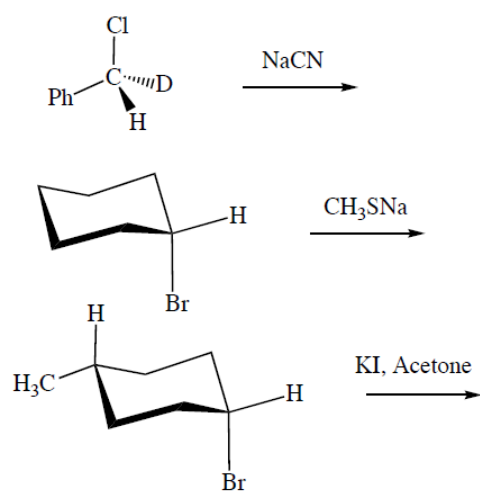
6. Given that the following three molecules have the absolute configurations given, show how each reactant gives a different outcome by E2.



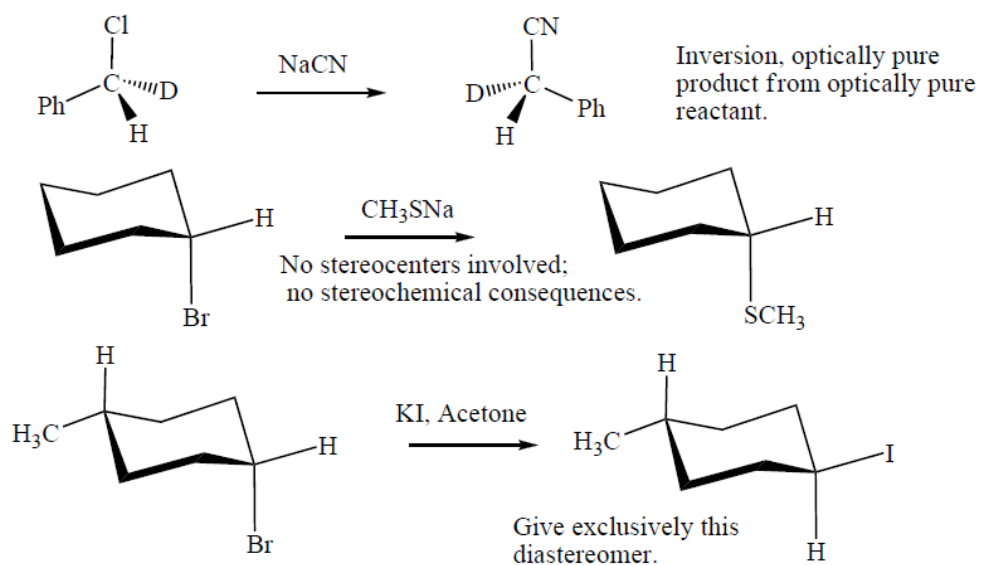
Ans:



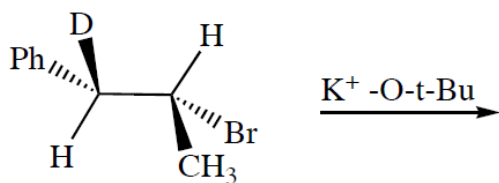
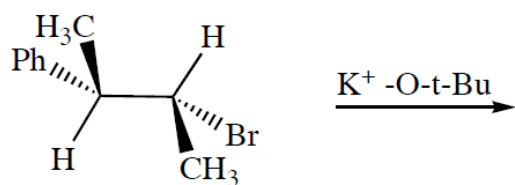
7. Indicate the stereochemical outcome of the following $\text{S}_{\text{N}}2$ reactions. Assume that all chiral centers are optically pure. Do these reactions all give racemic mixtures?



Ans:



8. What are the products of following E2 reactions:



Ans:

