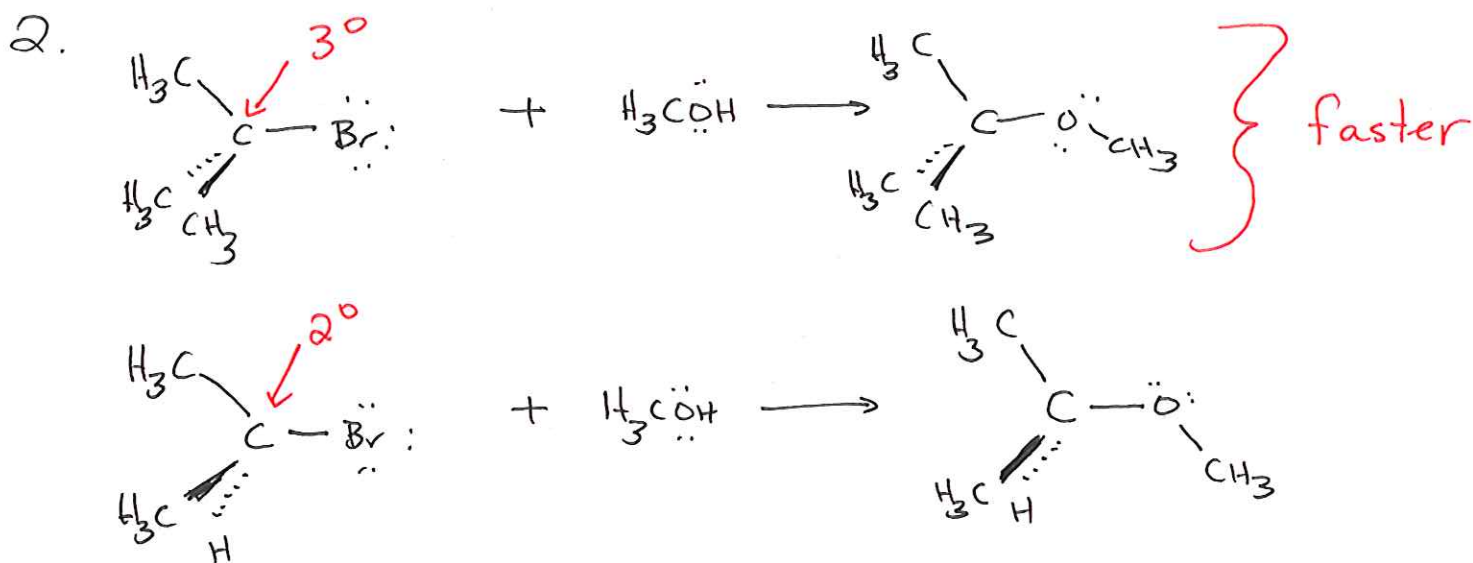


Chem 2500
Assignment #5 - S_N1/S_N2
Answer Key.

1a) Path A is favoured when $R=CH_3$ because the generated carbocation would be 3° , which is relatively stable, due to inductive stabilization. Path A is less sterically hindered than Path B, which also makes it favoured for the bulky $+Br^-$ reactant. Path B is favoured when $R=H$, because it does not proceed through an unstable 1° carbocation.

b) Path A would require a polar protic solvent to aid the leaving group's departure and to stabilize the ionic transition state.

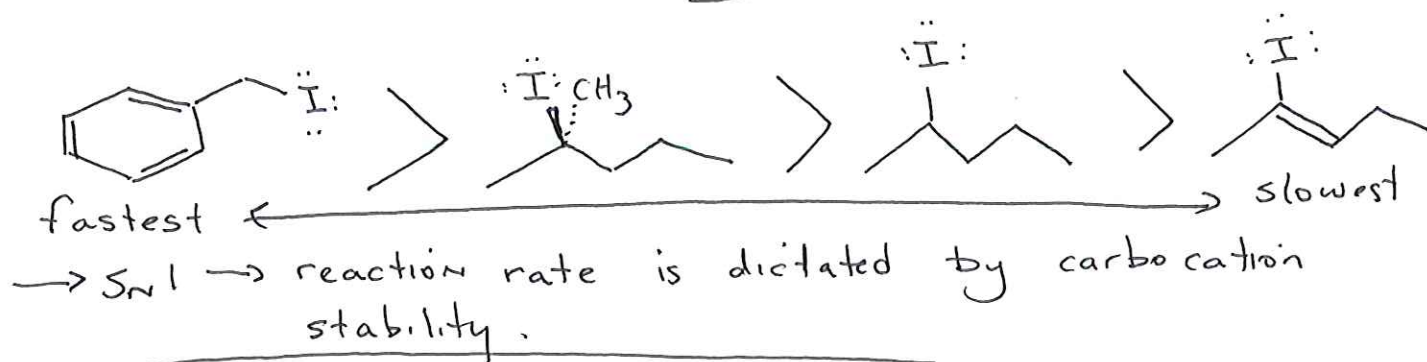


→ Both of these reactions are S_N1 solvolysis reactions. Therefore carbocation stability will dictate which reaction is fastest. The 3° substrate will form a much more stable carbocation.

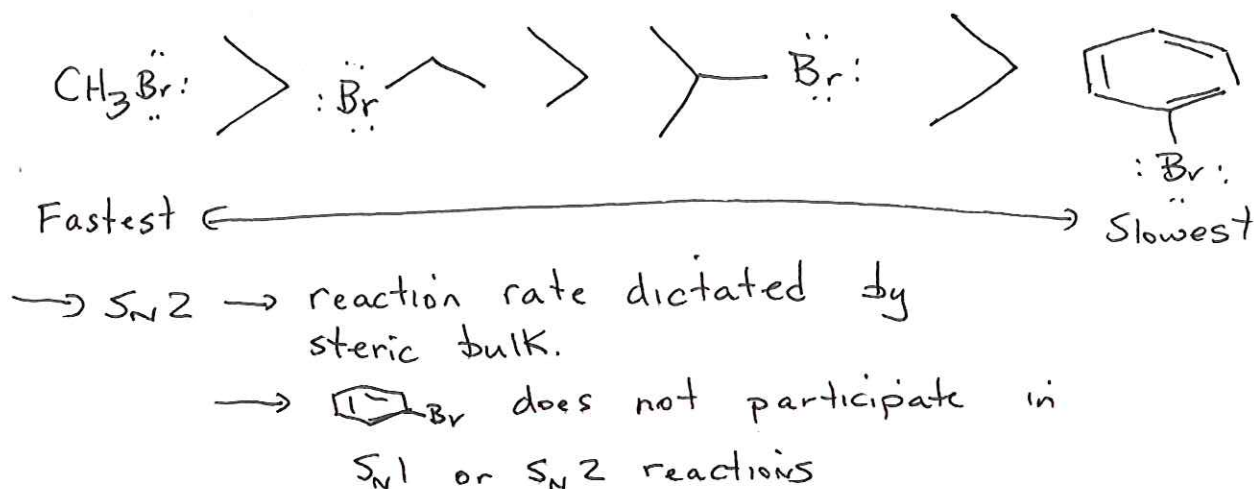
Assignment #15 - S_N1 / S_N2

Answer Key

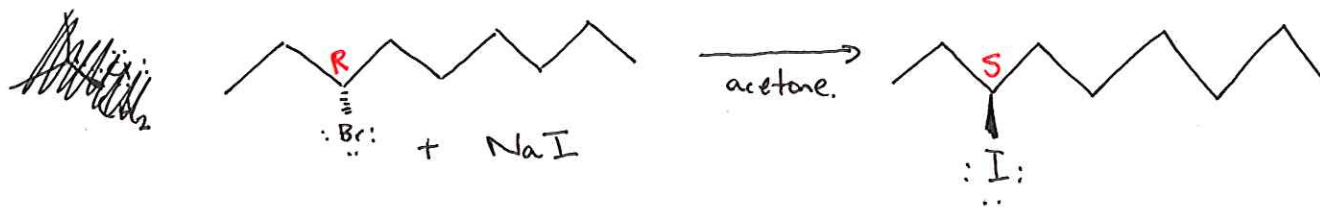
3.



4.



5.a)



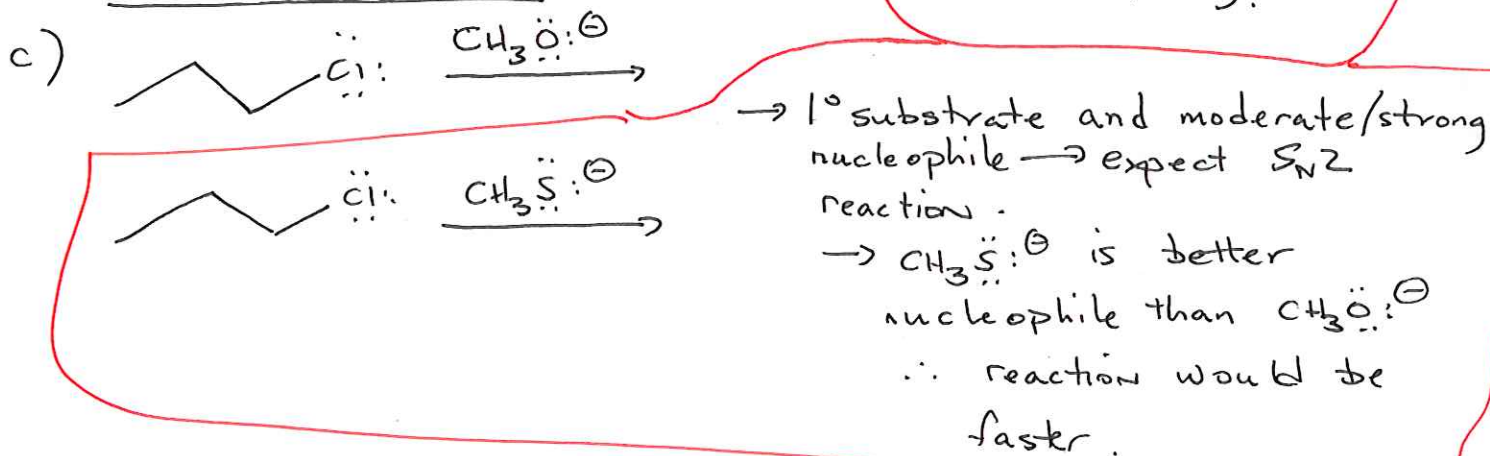
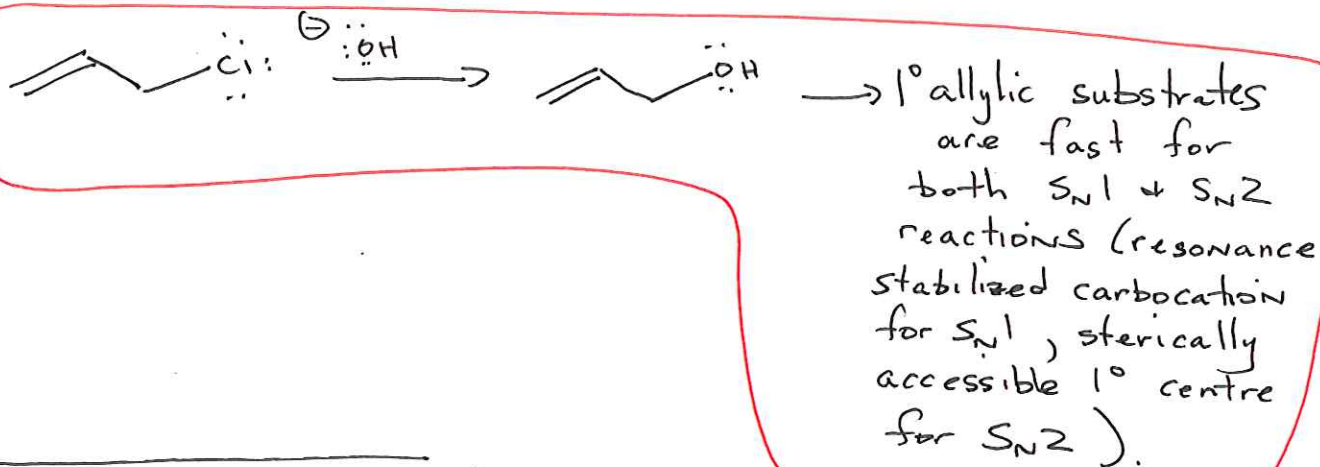
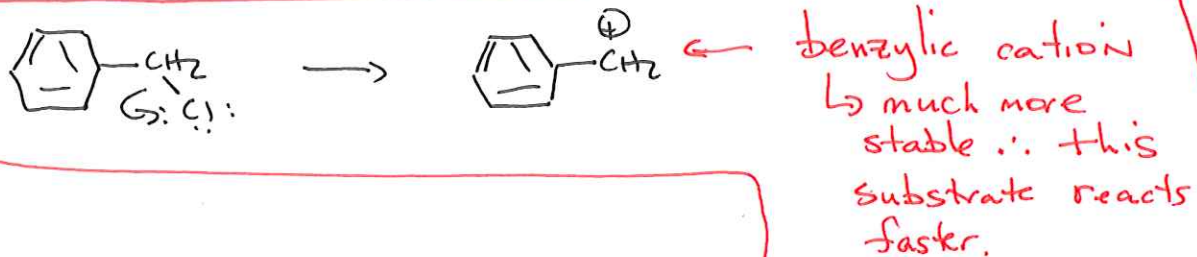
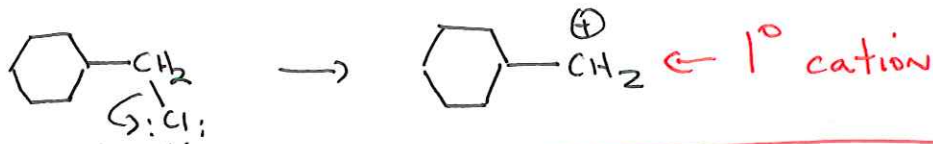
b) This is an S_N2 reaction ∴ expect inversion of configuration. Br and ~~Br~~ I both have the top priority. Hence R → S.

c) After 2 hours, only 1 enantiomer is present & as one would expect as S_N2 reactions are stereospecific. After 48 hours racemization has occurred because the initial product (S-3-iodononane) has undergone substitution from the excess I⁻ many times, resulting in continued inversion of configuration and ultimately a statistically random mixture (50/50) of R & S isomers.

Chem 2500
Assignment #15 — S_N1 / S_N2

Answer Key.

6a) → polar, protic solvent → expect S_N1

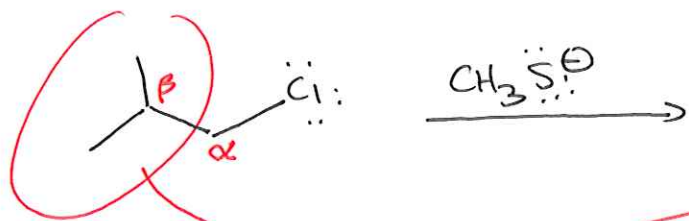


Chem 2500
Assignment #15 - S_N1 / S_N2
Answer Key.



→ 1° substrate, good nucleophile

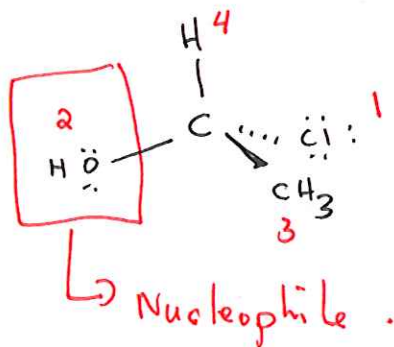
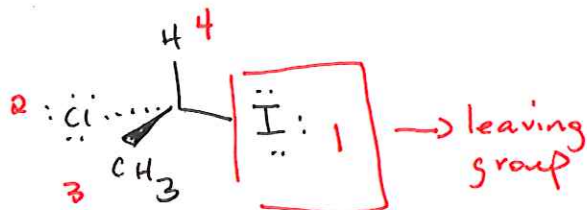
→ expect S_N2 rxn



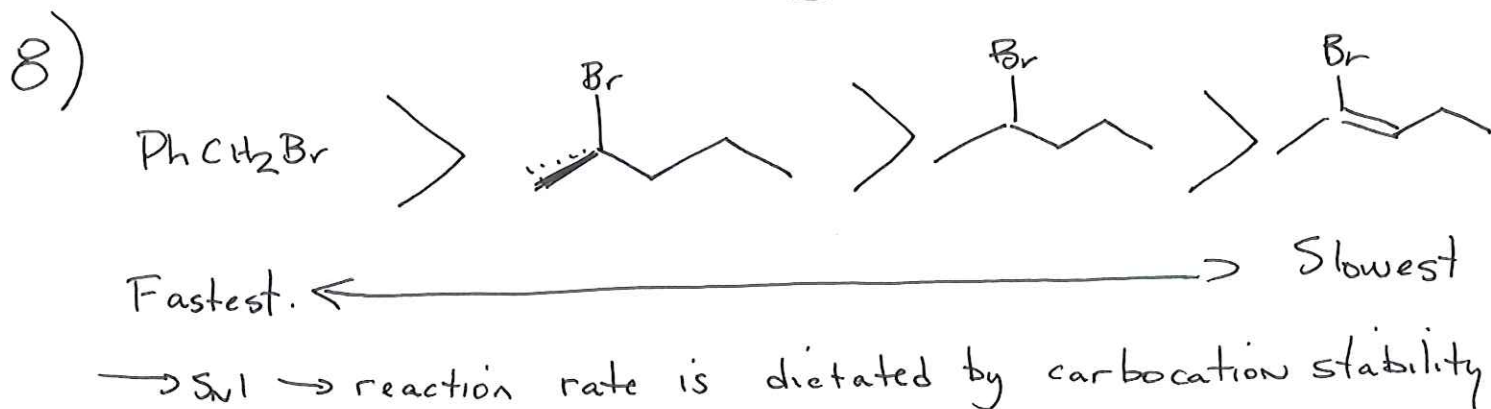
~~too~~

β-branching will make this reaction much slower.

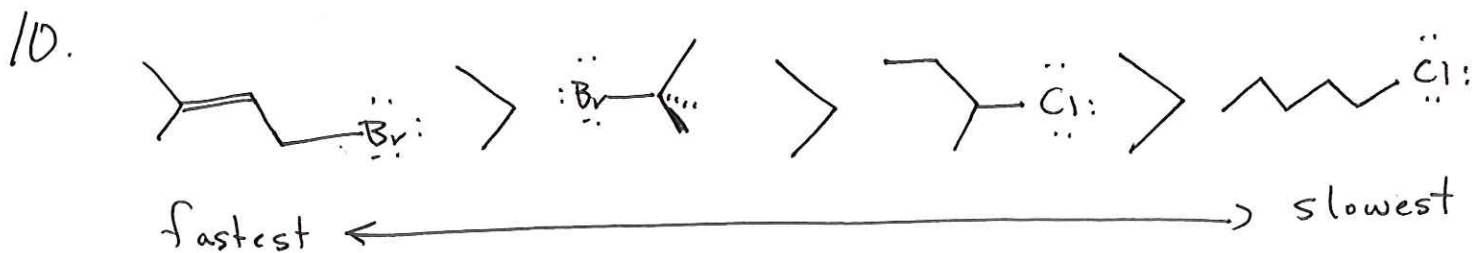
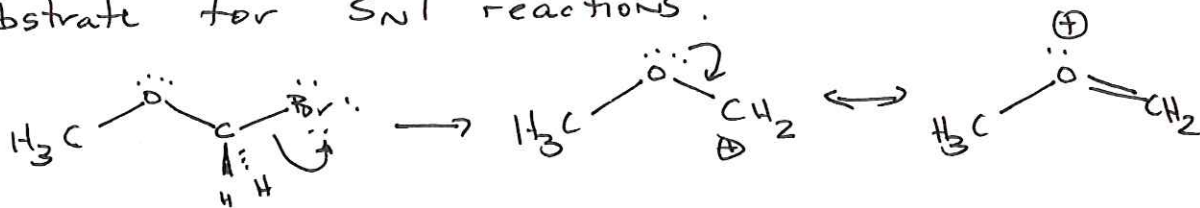
7. Although S_N2 reactions involve inversion of configuration, the absolute configuration depends upon whether or not the Nucleophile and leaving group have the same or different priorities. If the priorities are the same, the absolute configuration will change. If the priorities are different that is not necessarily the case.



Chem 2500
Assignment #15 - S_N1 / S_N2
Answer Key.



- 9.
- As a 1° alkyl halide this substrate is good for S_N2 reactions.
 - Since the resultant carbocation (formed via departure of :Br:⊖) is resonance stabilized by the lone pair on oxygen it is also a good substrate for S_N1 reactions.



- S_N1 reaction is dictated by carbocation stability.
- Cl⁻ is a worse leaving group than Br⁻
- No impact on relative order of reactivity in this case.