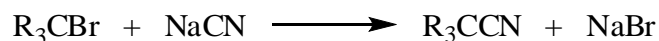


Chemistry 2500 (Fall 2017): Assignment #15 – S_N1 and S_N2

1. The following reaction:

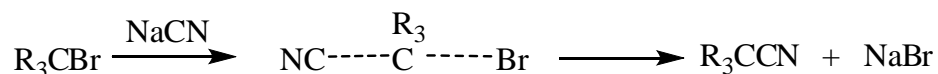


can proceed via 2 different pathways (Path A, Path B), each of which are outlined below.

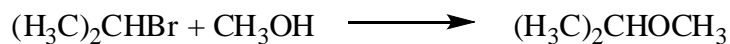
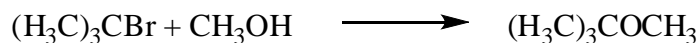
Path A:



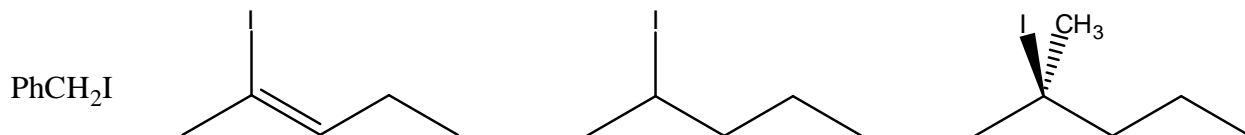
Path B:



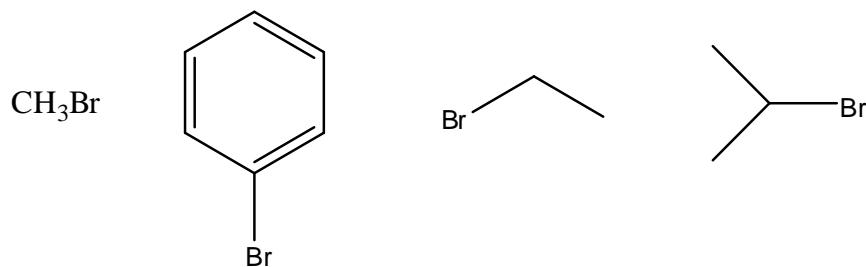
- a) Briefly explain why Path A is operative when R = CH₃, but Path B is operative when R = H.
- b) Which of the two pathways would you expect to require a polar solvent? Why?
2. Which of the following reactions would you expect to react faster? Why?



3. For each of the following compounds rank the expected order of reaction rate for an S_N1 mechanism:



4. For each of the following compounds rank the expected order of reaction rate for an S_N2 mechanism:

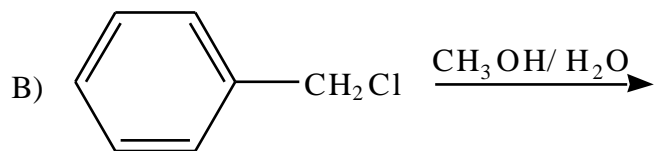
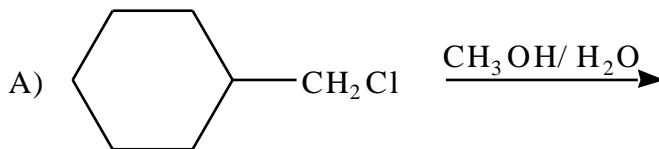


5. *R*-3-bromononane is allowed to stir with *excess* NaI in acetone at room temperature. Additional experiments establish that the rate of the reaction is dependent upon the concentration of both the bromononane and the sodium iodide.

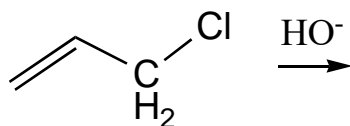
- Write an equation for this reaction.
- What is the expected absolute configuration of the product?
- Suggest a reason why if the product is isolated after 2 hours only one enantiomer is present, but if the mixture is allowed to stir for 48 hours a racemic mixture is obtained.

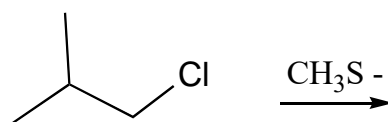
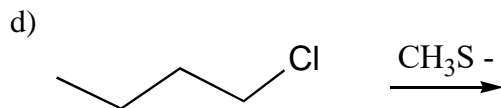
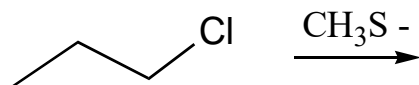
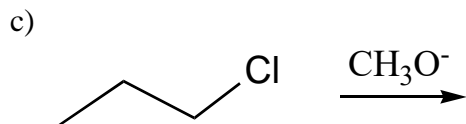
6. Of the following pairs of reactions, which one (if either) is faster. Explain your reasoning. Be sure to indicate which mechanism is operative.

a)

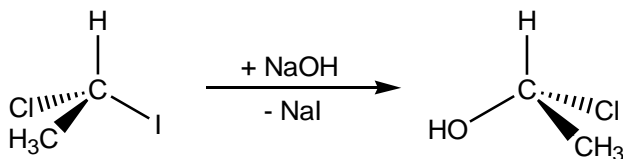


b)

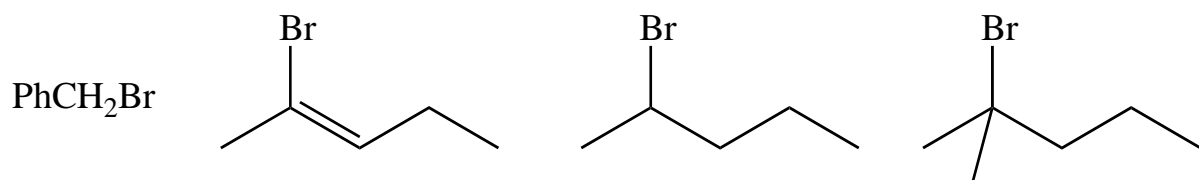




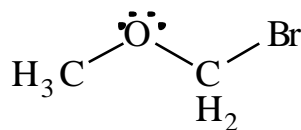
7. The following reaction proceeds via an $\text{S}_{\text{N}}2$ mechanism. Explain why the absolute configuration of both the starting material and product is R.



8. For each of the following compounds rank the expected order of reaction rate for an $\text{S}_{\text{N}}1$ mechanism. No explanation is required. (4 points)



9. Methyl bromomethyl ether (depicted below) is a good substrate for both $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. Why?



10. For the following four compounds, rank the molecules in order of rate of reaction in the S_N1 process. Explain your reasoning.

