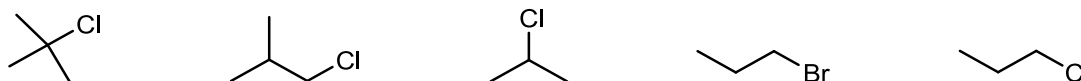


Several mechanisms form the core reactions for understanding organic mechanisms. Among these, the most common are S_N1, S_N2, E1 and E2. In this worksheet, you will focus on the substitution mechanisms.

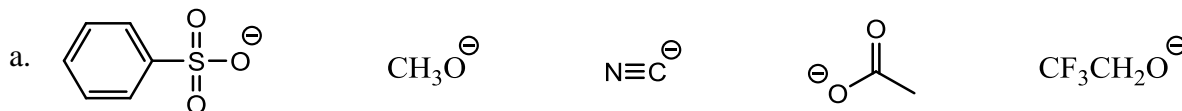
1. What conditions favor each reaction mechanism listed below?

Factor	S _N 1	S _N 2
Substrate		
nucleophile		
leaving group		
solvent		
orientation/stereochemistry		
temperature		

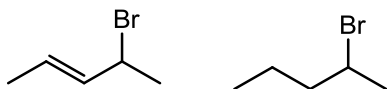
2. Rank the following alkyl halide substrates in order of increasing S_N2 reaction rate. Now rank the same compounds in order of increasing S_N1 reaction rate.



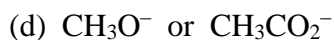
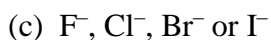
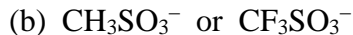
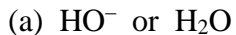
3. Rank the following species in order of their strength as nucleophiles.



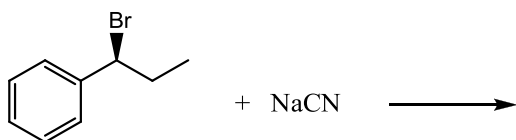
4. Assume that both of the following compounds happen to undergo an S_N1 reaction. Draw the intermediate for each compound. Which, if either intermediate, is more stable? Why? As a result, which should be formed faster? Therefore, which would be more reactive in an S_N1 reaction?



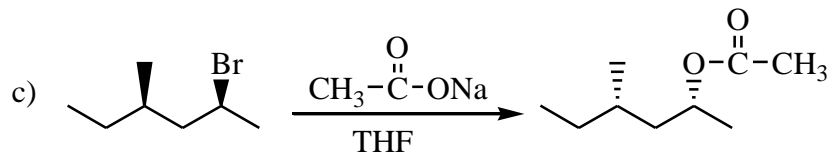
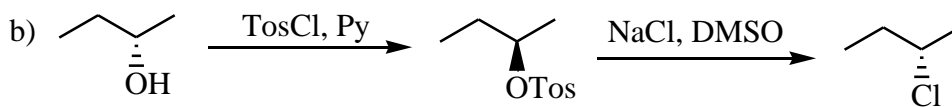
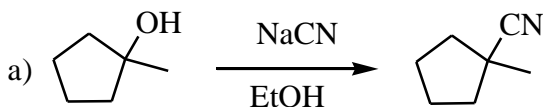
5. For each set of compounds, circle the better leaving group. Explain your choice



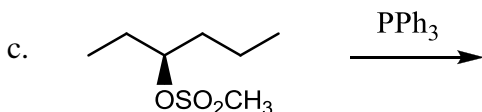
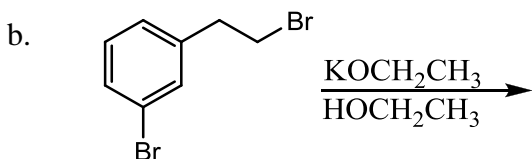
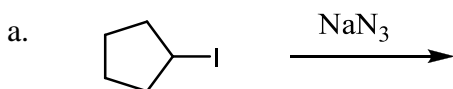
6. How would you be able to tell if the reaction listed below occurred by an S_N1 or an S_N2 mechanism? (hint—draw out the products of each mechanism)



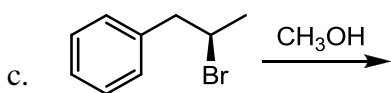
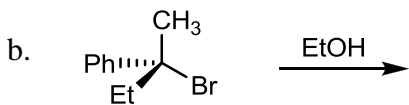
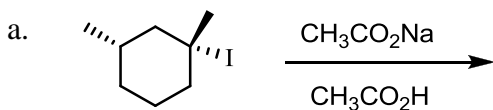
7. In each of the reactions below, explain what (if anything) is wrong with the proposed synthesis. (note: Tos = Ar-SO₂)



8. Give the expected major products for the following S_N2 reactions. Draw the movement of electrons for each reaction using mechanistic arrows.



9. Give the expected major products for the following S_N1 reactions. Draw the movement of electrons for each reaction using mechanistic arrows.



For further practice: Give the structure of the major product(s) or the reagents necessary to complete each of the following reactions. If necessary, indicate the product stereochemistry. It is recommended that you draw out mechanisms to solidify your understanding of the reactions.

