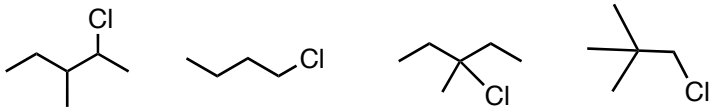
Organic Chemistry for Life Sciences: CHM 223 Section A

Problem Set Chapter 7

Name_____

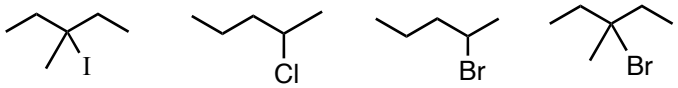
DUE in class: Wednesday November 15 @ 8am

1. Rank the following substrates according to their exected rate of reaction with a nucleophile in an **S_N2 reaction** from fastest >>> slowest.



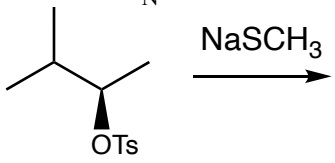
A B C D

2. Rank the following substrates according to their exected rate of reaction with a nucleophile in an **S_N1 reaction** from fastest >>> slowest.



A B C D

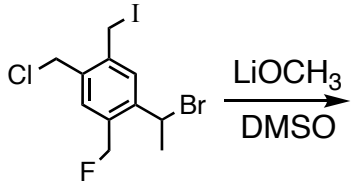
3. Draw the product and determine the configuration (R or S) for the starting material AND the product resulting from the S_N2 reaction below:



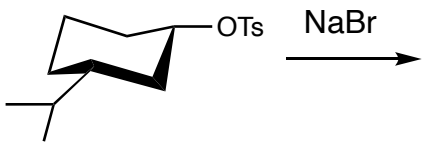
4. Which one of the following statements is true about the substrate 3-bromo-3-methylhexane?

A. It can react via both the S_N1 and S_N2 substitution reaction mechanisms
B. It cannot react by either the S_N1 or S_N2 substitution reaction mechanisms
C. It can react via the S_N1 but not the S_N2 substitution reaction mechanism
D. It can react via the S_N2 but not the S_N1 substitution reaction mechanism

5. The S_N2 reaction below was conducted with only ONE equivalent of $LiOCH_3$ (i.e. only sufficient $LiOCH_3$ to substitute at ***a single*** position). What is the predicted major product?

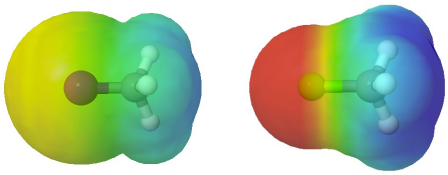


6. The name of the product formed from the following S_N2 reaction is (HINT: redraw the chair conformation as a planar 6-membered ring):



A. trans-1-bromo-3-isopropylcyclohexane
B. cis-1-bromo-3-isopropylcyclohexane
C. trans-1-isopropyl-3-bromocyclohexane
D. cis-1-isopropyl-3-bromocyclohexane

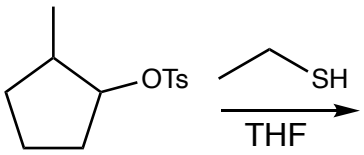
7. The electrostatic potential map for CH_3I (see I, below) shows much less deep red and blue colors than the electrostatic potential map for CH_3F (see II below). This is because:



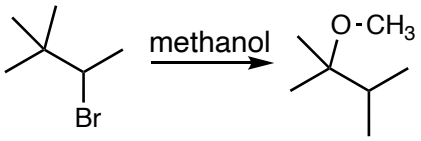
I II

A. The C–I bond is more polar than C–F so there is more δ+ on I and more δ– on C
B. The C–I bond is more polar than C–F so there is more δ– on I and more δ+ on C
C. The C–F bond is more polar than C–I so there is more δ– on F and more δ+ on C
D. The C–F bond is more polar than C–I so there is more δ+ on F and more δ– on C

8. Predict whether the following reaction is likely to proceed by an S_N1 or S_N2 reaction and *justify your answer* (i.e., consider the nature of the nucleophile, nature of the substrate, nature of the leaving group, and the solvent):



9. Draw the individual steps (including curved arrows!!) for the reaction mechanism to explain the following **S_N1 reaction**:



10. Jimmy says the following reaction will proceed via an S_N2 mechanism because "OTs is an excellent leaving group and CH_3OH is a strong nucleophile". Do you agree with Jimmy? Why or why not? What major final product is expected to form from this reaction (HINT: consider possible rearrangments)?

Jimmy