1. For each pair of reactions shown below, identify the $S_N 2$ reaction that will occur more readily.

a.k.a. PROBLEM SET#1, QUESTION 7

a) Circle the faster reaction: (5 points)



b) Circle the faster reaction: (5 points)



2) Draw the major product of the following reaction sequence. (10 points) a.k.a. PROBLEM SET#3, QUESTION 1



3) 3-Bromo-1-butene and 1-bromo-2-butene both undergo $S_N 1$ reactions at a comparable rate even though one is primary and one is secondary. Propose an explanation for this observation. (10 points) **a.k.a. PROBLEM SET#2, QUESTION 5**



Both substrates dissociate to give the same carbocation

POINTS EARNED ON THIS PAGE 4. Based on your knowledge of pKa values, rank the following in order of leaving group ability (1 being the best leaving group, 4 being the worst leaving group). (10 points)

1-	CH₃COO⁻	<i>t</i> -BuO [−]	H ₂ O
1	3	4	2

5. Rank the following in order of nucleophilicity (1 being most nucleophilic, 4 being the least nucleophilic). (10 points)

NH ₃	H ₂ O	NH4 ⁺	H_2N^-
2	3	4	1

6. Draw the major product for the following reaction. (10 points)



7.

a) Predict the major product of the following reaction. Answers without stereochemistry will be given no credit! (5 points)



b) In the space below, draw a detailed arrow-pushing mechanism for your answer. (5 points)





a) Which of the following two substrates would likely undergo faster E2 elimination (circle your answer)? (5 points)



b) Provide an explanation for your answer that includes 3-dimensional drawings. (5 points)



9.

Consider the following solvents. For each, draw the structure and circle the appropriate solvent classification.





8.

10. Propose a synthesis of compound A beginning from bromobenzene. You may also use fragments of **2-carbons or less**. You are encouraged to think about mechanisms and retrosynthetic analysis, but it is <u>not</u> necessary to show these in your final answer. (15 points)



Bonus: Draw the product of the following reaction (you must show a structure). (5 points extra credit)



