1. (a) Draw the substitution product(s), including stereochemistry, for the following reactions in the boxes provided. If no reaction will occur or the equilibrium is unfavorable, write NA.



(b) Clearly label the stereocenters as R or S in starting materials and products.

(c) Accidentally, a careless graduate student added three times as much solvent to each of the above reaction as he should have. The original reactions both would have been done in one hour but when should the student expect the reactions to be finished now?

Top reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Bottom reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. Rank the compounds shown below in order of how quickly they will undergo substitution under SN1 conditions (1-3, 1 = fastest.) Provide a 1-2 sentence explanation for your answer.



\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_

3. Using proper curved arrows, draw the mechanism for the following reaction:

