

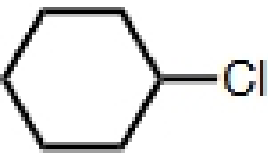
CHEM 232 Worksheet
S_N2

1. Draw the reaction coordinate diagram for the S_N2 reaction of 1-iodopropane with NH_2^- to form a neutral organic product. Be sure to include the starting materials, any intermediates, and products on the diagram. Draw the transition state for the rate-determining step. What is the hybridization of the reactive carbon center in the transition state?

2. Draw the reaction coordinate diagram for the S_N2 reaction of 1-iodopropane with NH_3 for form a neutral organic product. Be sure to include the starting materials, any intermediates, and products on the diagram. How does the shape (ie. number of peaks) differ from the reaction coordinate diagram you drew in problem 1? Why?

3. Rank the following sets of E-LG in order of increasing S_N2 reactivity.
 - a. $\text{CH}_3\text{CH}_2\text{Br}$, CH_3Br , $(\text{CH}_3)_2\text{CHBr}$

 - b. $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{Cl}$, $(\text{CH}_3)_2\text{CHCH}_2\text{Cl}$, $(\text{CH}_3)_2\text{CHCl}$

 - c. $\text{CH}_3\text{CH}_2\text{Cl}$, $\text{CH}_3\text{CH}_2\text{I}$, 

d. $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$, $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$, $(\text{CH}_3)_3\text{CCH}_2\text{Br}$

e. (Hint: Determine the lowest energy chair conformation of each cyclohexane ring.)



4. Rank (from most to least) the molecules in each of the following sets based on i) basicity, ii) nucleophilicity, and iii) leaving group ability.

a. H_2O , HO^- , CH_3CO_2^-

b. Br^- , Cl^- , F^- , I^- (For ii, consider both polar aprotic and polar protic solvent cases.)

c. NH_2^- , NH_3 , PH_2^- (For ii, consider both polar aprotic and polar protic solvent cases.)

d. OCN^- , SCN^- (For ii, consider both polar aprotic and polar protic solvent cases.)

e. H_2O , H_2S , NH_3

5. Give the product formed by the S_N2 reaction of 1-bromopentane with each of the given reagents below. Write "no reaction" when appropriate. (Be sure to evaluate the nucleophilic potential of each reagent.)
- H_2O
 - H_2SO_4
 - KOH
 - CsI
 - $NaCN$
 - HCl
 - $(CH_3)_2S$
 - NH_3
 - Cl_2
 - KF (assume water is used as the solvent)