

Nucleophilic Substitution Lab Report

NAME: _____

PARTNER'S NAME: _____

LAB SECTION: _____

DATE: _____

% SCORE:

Lab Notebook		
Abstract		
Hydrolysis Reaction: Mechanism		
Hydrolysis Graph Data:		
Unknown R-X identification via chemical tests		
Questions		
Essay: Discuss & Interpret your results		
Total		

A. ABSTRACT: HYDROLYSIS OF TERT-BUTYLCHLORIDE

B. REACTION MECHANISM OF SOLVOLYSIS

1. Using structures and arrows show the mechanism of hydrolysis of t- butyl chloride.
2. Identify the rate-determining step in the mechanism

C. GRAPH AND DATA MANIPULATIONS

1. Plot the data of $\ln(V_{\text{inf}} - V_t)$ on yaxis vs. time (minutes) on the x axis in a scatter plot in EXCEL or by hand. If you make a graph by hand use your graphing calculator to perform a linear regression on the data. Don't forget to include a point for $t=0$.
2. Add a linear trendline for the best fit line. Determine the equation of the line and display it on the graph. Clearly show your correlation coefficient, r^2 , on the graph. Correlation coefficient and equation can be displayed using options in trendline menu.

3. Report your Rate Constant ,k, below. Recall: $k = -\text{slope of your line}$.

Rate constant= _____ units?

Attach a copy of you graph to your report.

D. SN1 VS. SN2. UNKNOWN IDENTIFICATION VIA CHEMICAL TESTS

Put an X in the box if the unknown reacted

Unknown→ Reagent↓	A	B	C
Nal in Acetone			
AgNO ₃ in Ethanol			
Structure of unknown			

E. QUESTIONS:

1. Using your data from part A, Calculate the initial molarity of the tert-butyl chloride in your solution then use the concentration and your determined rate constant to calculate the initial rate of the reaction. Show your work.
2. What effect would running the Sn1 reaction in 70% isopropanol/30%water instead of 50% isopropanol/50%water have on the rate constant? Explain your reply. (hint :think about the effect of polar solvent on Sn1 reactions)
3. Briefly explain how you determined your unknown alkyl halides using chemical tests in part B.

F. DISCUSSION

Discuss your solvolysis of tert-butyl chloride. Which conditions suggest a SN1 reaction? Why was the acetone used to quench the reaction in this particular experiment? Also look carefully at your data. Your correlation coefficient is a measure of how well the points fit the line. Does the data fit the first order line treatment ($\ln$ - vs- t)? If not, which points are off line? Suggest a reason for this observation.