Disappearing X's   Name: _____
-Factors affecting reaction rate

Given the following solutions:
   2.0 M HCl
   0.17 M $Na_2S_2O_3$ (sodium thiosulfate)
and the equation: $HCl + Na_2S_2O_3 \rightarrow S_{(s)} + Na_2SO_4 + NaCl$

Lab preparation: Obtain approximately 50 mL of each solution in two separate, labeled beakers. You will use these to measure out the quantities needed for the lab using two separate graduated cylinders. DO NOT pour solutions back and be careful not to mix the solutions until you are ready to time the reaction.

Control Reaction: Take 5 mL of sodium thiosulfate solution in a beaker and put it on a sheet of paper with a black X on it.   Add 5.0 mL of HCl and note the time of addition of the acid. Swirl or stir the mixture briefly and let it stand. Note the time when the black X is no longer visible.

Effect of HCl concentration on the rate of reaction
   Repeat the control reaction with the 5 mL of sodium thiosulfate in a beaker three more times with the following changes:
   1. 4 mL of HCl and 1 mL of water
   2. 3 mL of HCl and 2 mL of water
   3. 2 mL of HCl and 3 mL of water

Effect of sodium thiosulfate concentration on the rate of reaction
   Repeat the control reaction with the 5 mL of HCl in a beaker three more times with the following changes:
   1. 4 mL of sodium thiosulfate and 1 mL of water
   2. 3 mL of sodium thiosulfate and 2 mL of water
   3. 2 mL of sodium thiosulfate and 3 mL of water

Effect of temperature on the rate of reaction
   Repeat the control reaction by adding 5 mL of HCl to 5 mL of sodium thiosulfate that has previously been:
   1. warmed to 40 ^{o}C
   2. warmed to 60 ^{o} C
   3. cooled to 10 ^{o}C

mL HCl	mL of $Na_2S_2O_3$	mL H_2O	Temperature ^{o}C	Time of rxn (s)
5	5	0	Room (control)	
4	5	1	Room	
3	5	2	Room	
2	5	3	Room	
5	4	1	Room	
5	3	2	Room	
5	2	3	Room	
5	5	0	40	
5	5	0	60	
5	5	0	10	

1. What generalizations are you able to make concerning the effect of each factor you varied on the rate of the reaction based upon YOUR results?

2. How is the rate of a reaction related to the time of the reaction?

3. It is found that a 10°C increase in temperature roughly doubles the rate of many chemical reactions. If a reaction takes 20 seconds at 40°C, how long would it take at 60°C?

4. Explain, using the collision theory, how each factor tested should alter the reaction rate.