Minilab [20 pts]
Rates of Reactions
The Iodine Clock Reaction

Name _____
Lab Partner(s) _____
Period _____ Date _____

Introduction: The purpose of this experiment is to determine the effect of concentration and temperature on the rate of a reaction. In this experiment, when two clear liquids are mixed, a blue color is produced after some time. The reaction mechanism is complicated, but all you need to know is that in the reaction iodine, I_2, is produced. The production of I_2 is obvious because when I_2 combines with starch, the solution will turn blue. Basically, we will monitor the rate of the reaction by observing how quickly I_2 is produced.

Solution A (cloudy): 0.5 g of Na_2SO_3, 5 mL starch solution, 5 mL of 1 M H_2SO_4-dilute to 500 mL
Solution B (clear): 2.2 g of KIO_3 diluted to 500 mL with water.

***PART I:* Concentration effects**

1) Obtain two small reaction strips (8 wells in each strip).
2) Go to the fume hood and get Solution A and Solution B, which are in a beaker and a flask that already have pipettes in them. Be sure to know which solution is which.
3) Fill a 150 mL beaker with tap water.
4) Carefully place the correct number of drops of each solution into the two strips as shown. (Only use every other well) *** Notice — there are a total of *four drops* of liquid in each well.

	Well #1	**blank**	**Well #2**	**blank**	**Well #3**	**blank**	**Well #4**
Strip #1	4 drops of A		4 drops of A		4 drops of A		4 drops of A
Strip #2	4 drops of B + 0 drops of H_2O		3 drops of B + 1 drops of H_2O		2 drops of B + 2 drops of H_2O		1 drops of B + 3 drops of H_2O
Reaction TIME (s) Trial #1							
Reaction TIME (s) Trial #2							
Reaction TIME (s) Trial #3							
Average Reaction Time (s)							

5) Now try turning a strip upside down-- Don't worry the liquid will not pour out—surface tension!!!
6) Now, place the two strips mouth-to- mouth such that the liquid in strip #2 will drop into strip #1.
7) Get organized-- you need a timer/recorder and an observer. Put strips on top of white paper-- easier to see.
8) Get stopwatch ready. When set, grasp BOTH strips firmly and sharply bang the set on a tabletop 2-3 times.
9) Watch the wells carefully. Record the time (in seconds) it takes for each well to turn blue (keep stopwatch going—don't stop until ALL wells have changed).
10) Rinse out strips and shake them dry. Do a second trial by repeating procedure. (Do a third trial if needed.)

PART II: Temperature Effects (Demo)-- Testing rates when solutions are hot, cold and at room temperature.

1) **Room temperature**: Take a test tube of A and one of B. Record temp of liquids.
2) **Hot Temperature:** Put a test tube of A and one of B into a hot water bath (~50-60^oC).
3) **Cold Temperature:** Put a test tube of A and one of B into a cold ice/water bath (~0-10^oC).
4) Record the reaction times & temperature data in the table below.

	Room temp =	**Hot temp =**	**Cold temp =**
Reaction Time (secs)			

Two Graphs: Obtain a piece of graph paper and fold in half. You will make two graphs on one piece of graph papter. Be sure to spread out your increments so that the axes take up the whole page. Show all axis labels and units and graph titles.

1) **Concentration Effects Graph:** On the top half of your graph paper, make a graph of *average reaction time vs. drops of solution B.* (reaction time on y-axis.) Start your graph at (0,0). Draw a best-fit smooth curve. (Do NOT connect point-to-point!)
2) **Temperature Effects graph**: On the bottom half of your graph paper, make a graph of *reaction time vs. temperature* (reaction time on y-axis). Use the data from the class demo. Draw a best-fit smooth curve. (Do NOT connect point-to-point.)

Post Lab Questions:

1) In strip #2, each well had fewer drops of solution B. Since there was always a total of 8 drops of liquid in each well, drops of B corresponds to the concentration of B.
   More drops of B corresponds to **a (higher, lower)** concentration of B.

2) a) As the concentration of B increases, the rate of the reaction **(speeds up, slows down).**
   b) Explain why one sees this relationship between concentration and rate of a reaction. (Explain by using the concept that molecules must collide to react.)

3) a) As the temperature increases, the rate of the reaction (**speeds up**, **slows down**)
   b) Explain why one sees this relationship between temperature and rate of a reaction. (Explain by using the concept that molecules must collide with sufficient energy to react.)