Chemistry Collision Theory and Factors that Affect Reaction Rates NAME:

Purpose: To observe how different factors affect reaction rate, and explain these observations using collision theory.

Part 1: Concentration

Purpose: to determine how concentration affects reaction rate and explain this effect using collision theory

Materials: 0.10M $Na_2S_2O_3$, 3M HCl, timer (phone), 50 mL beaker, 2-10 mL graduated cylinders, post it with an "X"

Procedure: Measure 10 mL of 0.10M $Na_2S_2O_3$ in the 50 mL beaker. Place the beaker on the "X". Pour 10 mL of 3M HCl into the beaker and start your timer. Stop your timer when you can no longer see the "X" from above. Record the time it took for the "X" to disappear. Make 10 mL of 0.30M HCl by mixing 1 mL of the 3M HCl with 9 mL water, and repeat the experiment.

Part 2: Temperature

Purpose: to determine how temperature affects reaction rate and explain this effect using collision theory

Materials: glow stick, ice water bath, boiling water bath

Procedure: Make an ice water bath in a 400 mL beaker and a boiling water bath in another beaker. Once the water is boiling, activate a glow stick and observe its brightness, then place it in the boiling water bath. Note the change in brightness. Take a second glow stick, activate it, and place it in the ice water bath. Note the change in brightness.

Part 3: Surface Area

Purpose: to determine how surface area affects reaction rate and explain this effect using collision theory

Materials: 2 Alka-Seltzer tablets, 2-250 mL beakers, mortar and pestle, glass stir rod

Procedure: Place 100 mL of water in each of the 250 mL beakers. Keep one tablet whole, and grind the second tablet into small pieces in the mortar and pestle. Place each sample in the separate beakers of water, stir with a glass stir rod, and observe/compare how quickly the tablets bubble and dissolve.

Part 4: Catalysis and Concentration

Purpose: to determine how a catalyst affects reaction rate and explain this effect using collision theory

Materials: 3% Hydrogen peroxide solution, yeast packet, 2 large test tubes, test tube rack, wood splint, matches

Procedure: place the test tubes in the rack and pour enough yeast in the second one to just cover the bottom of the test tube. Pour about 5mL of peroxide solution into each test tube and observe the difference in the rate of decomposition. Take a wood splint, light it on fire, then blow it out so that it remains a glowing ember, then carefully lower the ember into the space above the liquid in the first test tube. Repeat for the second test tube, and not the difference.

Data and Observations

Part 1

Data Table	Observations

Part 2

Data Table	Observations

Part 3

Data Table	Observations

Part 4

Data Table	Observations

Analysis and Conclusions

For each of the following questions, use your data and observations to justify your answers. When applying collision theory in your explanations, be sure to connect what is happening at the molecular level to your observations and results.

Part 1

How was the rate of the reaction measured?

How did the rate of the reaction change as the concentration of HCl decreased?

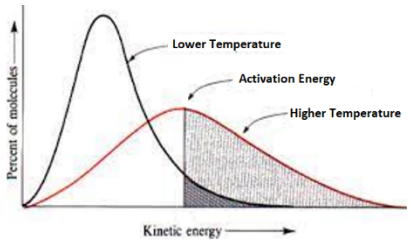
Use collision theory to explain why the rate of the reaction changed the way it did.

Part 2

How was the rate of the reaction measured?

How did the rate of the reaction change as the temperature of the system increased?

Use collision theory to explain why the rate of the reaction changed the way it did. Use the following graph to support your explanation.



Part 3

How was the rate of the reaction measured?

How did the rate of the reaction change as the surface area of the tablets increased?

Use collision theory to explain why the rate of the reaction changed the way it did.

Part 4

How was the rate of the reaction measured?

How did the rate of the reaction change when a catalyst was added?

Use collision theory to explain why the rate of the reaction changed the way it did. Use the following graph to support your explanation.