The Hudson School, Hoboken, New Jersey
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Reaction Kinetics ; Iodine Clock Reaction

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Date Performed ..... May 6th,2015
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1 Purpose

To find out the three things that affect the reaction rates. Those three things are catalysts, pressure, and concentration.

2 Hypothesis

I hypothesize that both concentration and catalysts have an effect on reaction rates.

3 Materials

- 2 Graduated Cylinder (1000 mL)
- Distilled Water
- Tray
- 3 250 mL Beakers
- 3 400 mL Beakers
- Stirring wand
- Stopwatch
- Thermometer
- Hot Plate

4 Procedure

1. Label 3 250 ml beakers 4a, 5a and 6a Label 3 400 ml beakers 4b, 5b and 6b
2. In each of the b beakers put 10 mL of Na2S2O5, 30 mL of starch and 40 mL of water
3. In beakers 4a (45 C) and 5a (10 C) add 50 mL of KIO3 and 150 mL of Water
4. In Beaker 6a add 50 mL of KIO3, 140 mL of water and 10 mL (1 mL Acid, 9 mL water) H2SO4
5. Pour 4b into 4a quickly and start the timer the moment the liquids touch.
6. Stop when you see a color change. Repeat following the pattern with the remaining beakers.
7. Fill all the B beakers with the following: .20 of Na2S2O5 (10 mL) Starch (30mL) H2O (40mL)
8. Fill 4A Beaker (45 Degrees C) with: 6 Seconds to convert 50 mL of KIO3 150 mL of H2O
9. Fill 5A (10 degrees C) with: 12 seconds to convert 50 mL of KIO3 150 mL of H2O
10. Fill 6A with (Room Temperature) : 3 seconds to convert 50 mL of KIO3 140 mL of H2O 10 ml of H2SO4 (1 mL of Acid, 9 mL of H2O)

5 Data

Beaker	**Potassium Iodate (mL)**	**Distilled Water (mL)**	**Catalyst H2SO4** (mL)	**Temperature**
1A	50	150	-	-
2A	100	100	-	-
3A	175	25	-	-
4A	50	150	-	45 C
5A	50	150	-	10 C
6A	50	149	1	-

For all B beakers

- .20 of Na2S2O35 (10 mL)
- 30 mL of Starch
- 40 mL of H2O

6 Discussion

6.1 Definitions

1. **reaction kinetics:** a branch of chemistry that deals with the rate of chemical reactions, with factors influencing such rates, and with applications of rate studies to elucidate the mechanism of reactions.

2. **catalyst:** a substance that increases the rate of a chemical reaction without itself undergoing any permanent chemical change.

3. **concentration:** The amount of a substance per defined space. Concentration usually is expressed in terms of mass per unit volume.

4. **activation energy:** in chemistry, the minimum amount of energy that is required to activate atoms or molecules to a condition in which they can undergo chemical transformation or physical transport.

6.2 Sources:

- http://www.merriam-webster.com/dictionary/reaction
- http://dictionary.reference.com/browse/catalyst
- http://chemistry.about.com/od/chemistryglossary/g/concentration.htm
- http://www.britannica.com/EBchecked/topic/4535/activation-energy
- http://www.explainthatstuff.com/catalyticconverters.html
- http://chemwiki.ucdavis.edu

6.3 Results

Beaker 4a: 6 seconds Beaker 5a: 12 seconds Beaker 6a: 3 seconds

6.4 Questions

1. What could be a good synonym for reaction kinetics? **Chemical Kinetics**

2. Which reaction was the reference reaction? What does that mean?

3. What were the three variables that had an effect on reaction rates? **Catalysts, concentration and temperature**

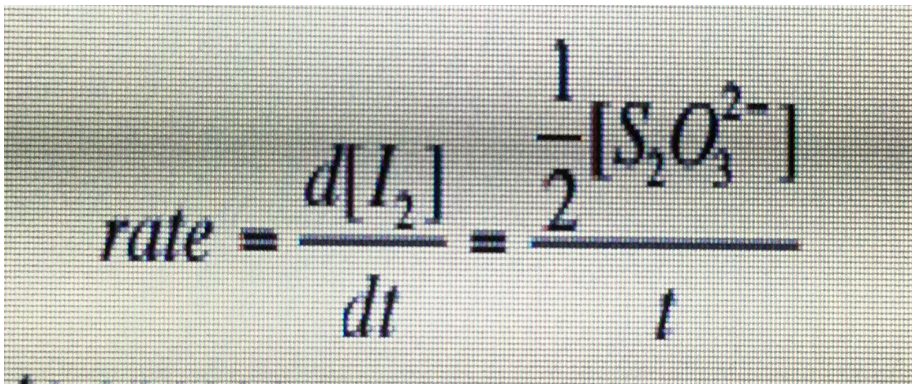
4. How does the collision model of chemical reactions explain reaction rates? **A chemical reaction occurs only when reactant molecules,ions, or atoms collide with an excess amount of kinetic energy and in "the proper orientation." The collision model explains why most collisions between molecules do not result in a chemical reaction (for example).**

5. What are catalysts called in living organisms? **Enzymes**

6. What kind of catalysts do cars have? Hint: look up catalytic converters **Catalytic converters are also known as Cats/Cat-cons. They aid in converting harmful chemicals in vehicles exhausts into gases that are harmless, such as steam.**

7. How do catalysts work? **A catalyst works by providing an alternative reaction pathway to the reaction product. The rate of the reaction is increased as this alternative route has a lower activation energy than the reaction route not mediated by the catalyst. A catalyst works by providing a convenient surface that enables a different route for a chemical reaction to occur.The reacting particles on the catalyst surface collide more frequently with each other and more of the collisions result in a chemical reaction because the different route provided by the catalyst has a lower activation energy.**

8. What is the actual reaction equation for this iodine clock reaction?



6.5 Critique

Explain the difficulties in the method for timing (assuming that all solutions were prepared correctly) and suggest improvements.

Never use beaker to measure volume, use a graduated cylinder.

7 Conclusion

Our hypothesis was right. Both the concentration and the catalyst had an affect on the reaction rates causing each reactions to either increase or decrease in time. From doing this lab I learned

1. How to efficiently use Overleaf to create a lab.

1. The factors that affect reaction rates.

1.