Rates of Reaction

**#46 Purpose:** Design an experiment to figure out the effect of particle size and temperature on reaction rates.

**#47 Purpose:** To study the effects of concentration, temperature, and a catalyst on reaction rate (reaction kinetics).

**#46 Hypothesis:**

* If I increase the surface area than the seltzer tablet will dissolve at a faster rate.
* If I increase the temperature than the seltzer tablet will dissolve at a faster rate.

**#47 Hypothesis:**

* I think that increasing temperature will increase the rate of reaction because it gets the molecules moving faster.
* I think decreasing the concentration will decrease the rate of reaction because it slows down the molecules.
* I think that adding a catalyst will increase the rate of reaction because it makes the product easier to form.

**#46**

**Materials:**

* Alka seltzer tablets
* Beakers
* Hot plates, hot water
* Ice
* Mortar and pestle
* Thermometers
* Clock

**Procedure:** In order to test for surface area’s effect we first broke up the tablet in the mortar and pestle. Then we drizzled it into the water and timed how long it took for the entire tablet to dissolve and then recorded the time. In order to test for temperature’s effect we heated our water to a boil and then we dropped the tablet into the water. We then timed how long it took for the entire tablet to dissolve and recorded the time.

**#47**

**Materials:**

* Flasks
* Test tubes
* Thermometer
* Ice
* Deionized Water
* Hot Plate
* Potassium Iodate
* 1M Sulfuric Acid
* Sodium Metabisulfite
* Timer
* Macropipettes

**Procedure:** We split up into two different groups in order to fill up the six different solutions A’s and the solution B’s which where all the same. We mixed each solution A with a solution B and timed how long it took for the solution to change color and then we wrote down the time.

**#46 Data Table:**

|  |  |  |
| --- | --- | --- |
|  | **Trial 1** | **Trial 2** |
| **Temperature** | **37 Seconds** | **28 Seconds** |
| **Surface Area** | **1 Minute 19 Seconds** | **1 Minute 13 Seconds** |

**Analysis:** In our lab we found that increasing the temperature is much more effect at increasing our reaction rate when compared to increasing the surface area. In fact in both trials it was twice as fast as our trials with ground up tablets. Calculations can be found on lab sheet.

**#47 Data Table:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** | **6** |
| **#1 [KIO3] Molarity (Concentration)** | **0.05M** | **0.1M** | **0.025M** | **0.05M** | **0.05M** | **0.05M** |
| **#3a moles of Na2S2O5** | **2 \* 10^-5 mol** | **2 \* 10^-5 mol** | **2 \* 10^-5 mol** | **2 \* 10^-5 mol** | **2 \* 10^-5 mol** | **2 \* 10^-5 mol** |
| **Temperature** | **24C** | **24C** | **24C** | **40C** | **10C** | **24C** |
| **Catalyst?** | **No** | **No** | **No** | **No** | **No** | **Yes** |
| **Time for blue color to appear** | **10.91 Seconds** | **5.06 Seconds** | **16.55 Seconds** | **5.26 Seconds** | **10.98 Seconds** | **0.00 Seconds** |
| **Rate calc moles/sec** | **1.7 \* 10^-6 mol/sec** | **4.0 \* 10^-6 mol/sec** | **1.2 \* 10^-6 mol/sec** | **3.8 \* 10^-6 mol/sec** | **1.8 \* 10^-6 mol/sec** | **Infinite mol/sec** |

**Analysis:** In this lab we found that concentration and temperature where actually pretty close in their effect but we found that using a catalyst was by far the most effective. In fact when used a catalyst the reaction was almost instantaneous. Calculations can be found on lab sheet.

**Conclusion:** Both of these labs showed that increasing the temperature of a reaction is more efficient than increasing the surface area, but this not much better by a very large margin. What we did find however is that using a catalyst will greatly increase the rate of reaction. In conclusion catalysts are the best way to speed up a rate of reaction.