

## Scientific Inquiry Lab report

### 1) Research Question:

How would you make hydrogen gas? In addition, how would you accomplish this task faster?

### 2) Background Information:

Chemical reactions are the formation of new substances and changes in energy. In order to form hydrogen gas, magnesium and acid can be used to produce hydrogen gas.

According to the collision theory (Chemical reactions occur when particles of reactants collide with enough force and at the proper angle.) in order to speed up this collision, there are three ways to do this:

**Increasing the temperature-** If you increase the temperature of the acid, the particles of reactants move much faster than the particles of the acid on a lower temperature. This will increase the rate of particles colliding with the magnesium which will eventually make the reaction faster.

**Concentration of acid-** The concentration of the acid will change the speed of magnesium reacting with acid. As the concentration of acid increases, it means that there are more particles of reactants than the acid with a lower concentration in the same amount of acid. As the concentration increases, there will be more particles colliding with the magnesium, and a higher rate of those particles hitting the magnesium at the right angle with the right force.

**Catalyst-** If you put catalyst in the acid, the catalyst will increase the rate of the reaction by lowering the activation energy of a reaction. That means that the acid will react more easily compared to the acid that would not have the catalyst. For example, if the activation energy of the normal energy is a mountain, the activation energy of acid with the catalyst is a hill, which is easier to go up, and easier to go over.

### 3) Hypothesis:

If I put the magnesium into the acid with a higher concentration, then the magnesium will react faster.

- **Independent Variable (IV):** The concentration of acid
  - The concentration of the acid will be the independent variable which means that it will be changed every time I experiment, and that it will influence the dependent variable.
- **Dependent Variable (DV):** The reaction rate
  - The reaction rate will differ as the concentration of the acid (IV) will change. This is because the reaction rate depends on the concentration of the acid.
- **Controlled Variable (CV):** The amount of magnesium, the amount of acid, and the temperature of acid
  - The amount of magnesium is going to be controlled by putting one magnesium piece into the test tube. The amount of acid will be controlled by measuring the amount of acid each

time. Lastly, the temperature of the acid will be maintained at normal classroom temperature. These variables need to be controlled because the changes of these variables can change the result of the experiment.

● **Materials:**

- Test tube (x3), magnesium (x9), acid (3 of different concentrations)

**4) Procedure:**

- 1- First, I put the same amount of acid into three test tubes.
- 2- Then, I start with the first test tube by put the magnesium in the acid, starting with the acid that has the lowest concentration.
- 3- I record the time until the magnesium finishes reacting and until I cannot hear the sound of the magnesium reacting.
- 4- With the same amount of magnesium and acid which also is all the same temperature, I repeat the upper two steps three times.
- 5- Then, I repeat the whole process with an acid that has a higher concentration.
- 6- When I finish experimenting the acid with a concentration of 1.0, I finish the experiment.

**5) Data**

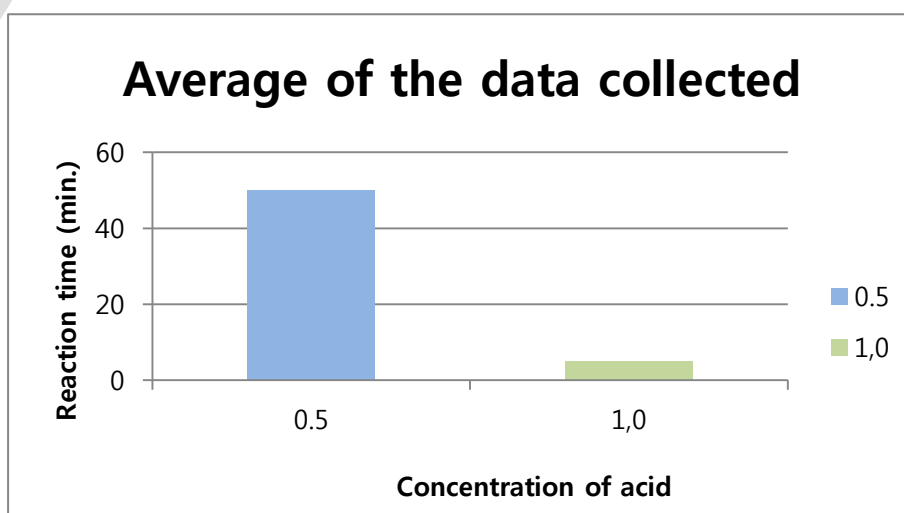
**A. Table**

**Data Collected from the Experiment**

Test # Strength of acid	T1	T2	T3	Average
*0.1	40(min.)	40	40	40
*0.5	50(min.)	50	50	50
1	05:03''78 =5.05(min.)	05:12''14 =5.2	4:41''39 =approx. 4.68333..	Approx. 4.977666...

\*This data could not be collected due to lack of class time.

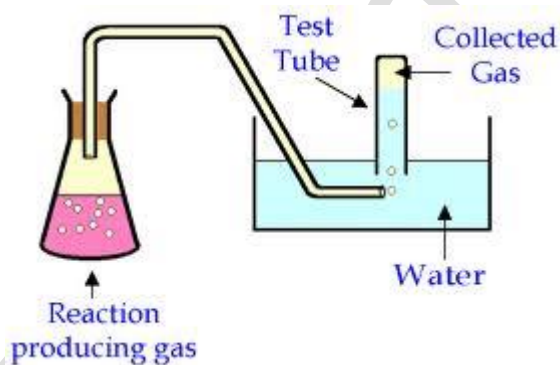
**B. Graph**



## 6) Conclusion

- A. According to the data (for column 0.5 and 1.0), it showed that as the concentration of acid gets lower, it takes longer for the magnesium to react. Also, as the concentration of acid gets higher, it takes shorter for the magnesium to react. This proves that my hypothesis was correct.
- B. As the concentration in this graph between 0.5 and 1.0 means that 1.0 is twice the concentration (100% increase) of 0.5. The time for the 0.5 acid took about ten times more than the 1.0 acid, and by that, I can predict that every time the concentration doubles, the time gets decreased by the tenth. I excluded the result of the 0.1 from the conclusion and the graph because it was not done and it did not support our hypothesis.
- C. The reason that the acid with a higher concentration reacts faster is because as the concentration increases, there are more particles of reactants in the same amount of area and they collide with the magnesium. Because there are more particles in the acid, more particles collide with the magnesium which makes it react faster.
- D. Evaluation: However, in this experiment, the time that took for the 0.1 acid took too long (over our class time) and we could not finish the experiment. In order to have finished this experiment, we could have done it in class over lunchtime, or we could have done it by another way. We could have seen how much hydrogen that magnesium and acid releases in a certain amount of time. In order to do that, we could have used two test tubes, a bucket of water, magnesium, and a tube. If hydrogen gets released inside the test tube where the acid and magnesium is reacting, it will go out the tube and into the test tube that is inside the water, upside down. Then, the gas will push the water out, which makes it so that we can calculate the amount of gas in the test tube. We could have just measured the amount of gas released in a certain amount of time, and it could have been more accurate and simple.

This is the picture explaining the experiment we can do if the experiment was to be repeated.



## Works Cited

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