Lab with the different concentration. the different concentration

lab performed: November 27th, 2017Background Information & Aim: The chemical reaction takes place due to the collision theory, which is stating that reacting particles should move and collide each other in a correct orientation and with enough kinetic energy that they form products. There are 6 major factors that affect the reaction rate, which stands for amount of reactants changing to products in a certain unit of time. The major 6 factors are nature of reactants, concentration, pressure, temperature, surface area and catalyst. This experiment will find out the change of reaction rate with the different concentration. The different concentration of HCL will be used as the independent variables, and it will be combined with the $CaCO_3$ (calcium carbonate) to have a reaction and measure how much time will be spent during the reaction, which is dependent variable.

Research Question: How does the reaction rate will change by using the different concentration of HCL with calcium carbonate ($CaCO_3$)? Variables Independent Variable Different Concentration of HCL This variable will be changed by different concentration which are 1M, 3M and 6M Dependent Variable Time of reaction Time of reaction will be measured by stop watch after adding the HCl in the flask with calcium carbonate. Controlled Variables: Amount of $CaCO_3$ The amount of is important since it will affect the reaction strength. If there is more $CaCO_3$ in the solution, it will have more concentration for the calcium carbonate, which will not make the experiment accurate. Since this experiment is for using the different concentration just for the HCl, same amount of $CaCO_3$ is needed.

This experiment will use 20g of $CaCO_3$. Volume of HCl The Volume of HCl is important since this experiment should only have different concentration. In

order to make them to have different concentration, they need to have same amount of HCl, but different amount of water with same volume. Thus the same volume of HCl is needed. This experiment will be used 30mL of 1M, 3M and 6M HCl for every single experiment. Same temperature The temperature should be equal since it is a one of the factor that affect to the reaction rate. Since this experiment is only focusing the factor of concentration, using same temperature for every single experiment is needed.

This experiment will take place with the room temperature (26C). Hypothesis: I think the solution that has higher concentration of Calcium Carbonate will react faster than the other solutions. In order to have reaction to happen, the particles should collide. If there is higher concentration in the solution, the chances of collision occurs will get greater. Thus, the reaction rate and the concentration will be proportional; if the concentration is higher, the reaction rate will increased.

Materials: 1 electronic balance calcium carbonate powder (20g for each) 1M, 3M and 6M Hydrochloric acid (60mL for each)Safety goggles 3 Flask for each experiment graduate cylinderStop watch GlovesSpatulaBeaker Petri dish Notebook with X sign picture of electronic balance, $CaCO_3$, petri dish and beaker. Method: 1. Put the safety goggles and wear the lab gown. 2. Get a clean flasks3.

Put the Calcium Carbonate in the petri dish and measure it by using the electronic balance to get 20g. 4. Put 20g of Calcium Carbonate inside of the beaker. 5. Get a 60mL of 1M HCL by using the graduated cylinder6.

Put the 1M HCl insider of the flask. 7. Put the Calcium Carbonate in the flask which already has a HCl.

8. Press the stop watch right after putting the Calcium Carbonate inside of the flask. 9. Place the flask on the note book which has X mark. 10. Press stop button of the stop watch when you cannot see the X mark on the notebook.

11. Record the time that has been taken for the reaction12. Repeat 2-8 two times13. Repeat 2-8 with 60mL of 3M and 6M HCl with 3 trials 14. Clean the sink and materials that have been used. The liquid should not be poured in the sink – put it in the container, which is designated by the teacher. Safety Precautions: 1.

Wear goggles and lab gown. 2. Do not touch any liquid. 3. Wear the gloves. Reaction occurred X mark after reaction Results: Before Adding CaCO3 During Reaction After reaction HCl+CaCO3 Transparent and colorless liquid bubbles appear, color suddenly changes to the opaque white white color gradually changes to the transparent same as before the reaction Reaction time with different concentration of HCl 1M HCl+CaCO3 3M HCl+CaCO3 6M HCl+CaCO3 first trial 35 sec 20 sec 5 sec second trial 36 sec 24 sec 4 sec third trial 32 sec 22 sec 6 sec Average ~34 sec 22 sec 5 sec Reaction Rate ~0. 03 (3x 10-2) ~0. 05 (5x 10-2) 0.

2 (2x 10-1) 1M HCl+CaCO3 = (35+36+32)/3~34 seconds 3M HCl+CaCO3 = (20+24+22)/3 = 22 seconds6M HCl+CaCO3 = (5+4+6)/3 = 5 seconds Reaction rate according to the concentration = concentration (M) / time (s)

1M HCl+CaCO3= 1/34sec = 0. 03 = (3x 10-2)3M HCl+CaCO3 = 3/22sec = 0. 13 = (1.

3x 10-2)6M HCl+CaCO3 = 6/5 sec = 1. 2 Graph: This graph shows that the time is getting decreased as the concentration getting higher. By looking at this graph, it is clear that if there is high concentration, the reaction will occurs faster so that the time spent for the reaction is getting shorter. Thus, the reaction rates will be increased as the concentration increased. This graph shows that if the higher concentration is used for reaction, the reaction rates will be increased. Thus, the reaction rate is proportional to the concentration.

Conclusion: The chemical equation of this experiment (mix the reaction of CaCO3 and HCl) is = CaCO3 (s) +2HCl (aq) CaCl2 (s)+H2O(l) +CO2(g). Thus, during the experiment, I could notice that when I put the CaCO3 in to the HCl, the gas appears, which is CaCl, and changes the color of the solution, but after the certain time, the color returns from white to the transparent which is same as the HCl before adding the CaCO3. So it was able to see the reaction time from when it changes the color and then returns to the transparent by putting flask with solution on the note book which has X sign. According to the trends of data table, when I used 1M of HCl with CaCO3, for first trial, it took 35 second to see the X sign, 36 seconds for second trial and 32 seconds for third trial.

So the average time that was taken for reaction is (35+36+32)/3 ~ 34 seconds. When I used 3M of HCl with CaCO3, for first trial, it took 20 seconds for the reaction, 24 seconds for second trial and 22 seconds for third trial. So

the average time that was taken for reaction is (20+24+22)/3 = 22 seconds. Lastly, when I used 6M of HCl with CaCO3, for first trial, it took 5 seconds for reaction, 4 seconds for second trial and 6 seconds for third trial.

So the average time that was taken is (5+4+6)/3 = 5 seconds. By looking at this result, it is clear that the time is getting shorter as the concentration that is used in the experiment is getting higher. My hypothesis was verified. The initial hypothesis stated that if there is higher concentration in the solution, the chances of collision occurs will get greater so that the reaction rate and the concentration will be proportional. According to my data, the equation for calculating the reaction rate for concentration is concentration / time taken.

Thus the reaction rate with 1M is 0. 03 (3×10-2), 3M is 0. 13 (1.

3×10-1) and 6M is 1. 2 According to the graph made by these information is curved graph with increasing values. It states that the concentration and reaction rate is proportional so if the concentration increases, the reaction rate also increases. The reaction takes place due to the collision theory; the moving particles should be collided in correct orientation with enough kinetic energy.

If the concentration increases, the particles will be increased in the given unit of the volume. Thus, if the mixture has the higher concentration, it will lead more collision between the reactant particles, and more collision leads to more faster reaction. The reaction rate increases as the increasing of amount of effective collision occurs, so reaction rate and the concentration is proportional each other.

If concentration increases, the reaction rates also increases. Evaluation: Source of data error Improvement of error Contamination between the different concentration of HCl There was contamination between the different concentration of HCl since we only used one graduated cylinder to measure the volume of the 3 different concentration of HCl, so that we could not get correct data. The graduated cylinder must be cleaned before getting the new liquid to measure the volume. Also, we can just get two more graduated cylinder and mark it to only use each one of it for the same concentration of the HCl.

The powder of CaCO3 dropped to the table while putting it in to the flask. When I was putting the CaCO3 powder to the flask which has HCl, the powder dropped a lot in the table so that we could not put the same amount of CaCO3 powder to get the accurate data. We should use a funnel or move the power to the beaker and then put it in to the flask to put the same exact 20g of the CaCO3 power.

Further experiment: The experiment that I can do further is that see and measure the reaction rate with different concentration of HCl, having reaction with CaCO3, but this time measure the volume of gas for measuring the reaction rate. the HCl will be measured and then poured into a flask. CaCO3 will be also put into the flask and the rubber band attached to the syringe will be put over it afterwards. At the same time, the timer will be started and then after certain minutes, the amount of the CO2 released will be recorded by looking at the measurement on the upturned measuring cylinder. It will help for finding the changes of reaction rate with different way but using the same materials, which are HCl and CaCO3.