CALIFORNIA STATE SCIENCE FAIR
2012 PROJECT SUMMARY

Name(s)
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Project Number
J0610

Project Title
Effect of Temperature on a Chemical Reaction

Abstract

Objectives/Goals
In this experiment, I decided to find out how temperature would affect endothermic reactions compared to exothermic reactions. An endothermic reaction absorbs energy in the form of heat. This reaction feels cold because it is taking heat away from its surroundings. It also releases gases. An exothermic reaction is a reaction that releases energy as heat. Since the energy is released, the exothermic reactions feel hot.

Methods/Materials
I did three experiments. I mixed lemon juice and baking soda,ammonia and vinegar, and finally, hydrochloric acid and sodium hydroxide. I did each experiment when the acid was 0, 20, 40, 60, and 80;all in degrees Celsius. Therefore, I could compare the exothermic reaction with the endothermic reaction at each temperature. For the Lemon Juice + Baking Soda experiment, I had a different set-up. On a beaker, which had baking soda in it, I put a stopper. The stopper had two holes that I put tubes through. At the end of each tube, there was a syringe. In one of the syringes, I had lemon juice. When I released that syringe, the second one would inflate. Therefore, I could accurately measure the amount of gas being produced. For the vinegar + ammonia test, I had the ammonia in the beaker, and I poured the vinegar into it. Similarly, for the hydrochloric acid + sodium hydroxide test, I had the sodium hydroxide in the beaker, and I poured the hydrochloric acid into it.

Results
I did each test 4 times. This is the average of all the tests. 0,20,40,60,80 are all in Celsius.
Lemon juice+baking soda: 0-15mL; 20-23mL; 40-30mL; 60-33mL; 80-40mL.
Vinegar+Ammonia(results in Celsius): 0-3; 20-23; 40-43; 60-63; 80-82
HCl+NaOH(results in Celsius): 0-44; 20-53; 40-64; 60-72; 80-90

Conclusions/Discussion
For the lemon juice + baking soda experiment, as the temperature went higher, more gas was produced. The vinegar + ammonia experiment was a very weak exothermic reaction. The temperature of the resulting product only increased by 2-4 degrees Celsius and no gas was produced. In the hydrochloric acid + sodium hydroxide test, the temperature increased drastically from 8-34 degrees Celsius and produced no gas. Overall, I correctly guessed how rapidly the temperature increased and decreased, and the amount of gas one reaction would produce compared to another. Thank you judges for reading my abstract.

Summary Statement
My project is about changing the temperature of the acid in a chemical reaction to see how the factor of temperature affects an exothermic reaction compared to an endothermic reaction.

Help Received
My science teacher gave me advice on how to improve my project; my mom helped me heat up the chemicals and watched over me as I did the experiment.