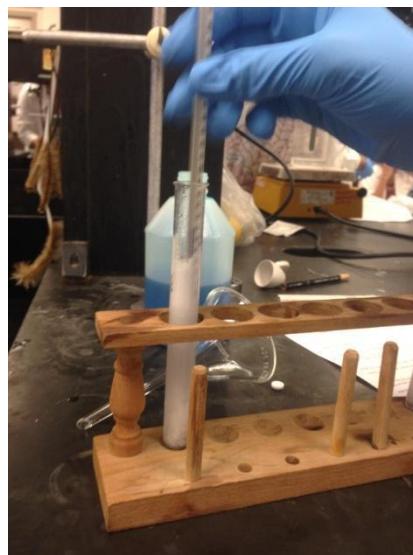




California State University of Bakersfield, Department of Chemistry

Hot N Cold



Standards:

NS32 C.2 - Compare and contrast hypotheses, theories, and laws.

KE23 C.1 - Define enthalpy and entropy and explain the relationship to exothermic and endothermic reactions:

• $\Delta H < 0$ = exothermic reaction

• $\Delta H > 0$ = endothermic reaction

Introduction:

Stir and see the difference! In this experiment you will witness both endothermic and exothermic reactions. By using simple materials such as vinegar, baking soda, hydrochloric acid, and magnesium, observe energy transformations!

Materials:

- 100 mL beakers
- Plastic cups

This material is based upon work supported by the CSUB Revitalizing Science University Program (REVS-UP) funded by Chevron Corporation. Opinions or points of view expressed in this document are those of the authors and do not necessarily reflect the official position of the Corporation or CSUB.

- Vinegar
- 3 Test tubes
- Baking soda
- Thermometer
- Graph paper
- Hydrochloric acid
- Magnesium metal

Safety:

- Always have an adult with you to help you during your experiment.
- Always wear eye protection, aprons, and gloves when doing chemistry experiments

Procedure:

1. Pour 50 mL of vinegar into the 100 mL beaker and then use the thermometer to record the temperature of the vinegar.
2. After finding the constant temperature, measure 8.68 g of the baking soda into a small plastic cup.
3. Gradually pour the baking soda into the beaker, measuring the temperature each time you pour more baking soda into the vinegar solution.
4. Make sure to record your data each time you pour more baking soda into the beaker.
5. Repeat this two more times, but the second time add five more grams of baking soda into the plastic cup.
6. The third time, add another five grams, giving a total of 18.68 g to add to the beaker.
7. Graph your recordings on the table.
8. For the second reaction, pour 10 mL of hydrochloric acid into each of the test tubes.
Make sure to record the temperature of the acid before adding the magnesium metal.
9. For the first tube, add 0.1 g of magnesium metal and record the temperature.
10. The second time, add 0.2 g of the metal into the second test tube and record the temperature, and for the third time add 0.3 g into the hydrochloric acid into the last test tube.
11. Observe and record the data.
12. Make a time vs. temperature graph.

Questions:

1. Does graphing your data result in a straight line? How?
2. What reaction was endothermic and what reaction was exothermic? How do you know?
3. How did changing the solution result in a change of temperature?

References:

1. Cfep.uci.edu (Date Accessed:July 16, 2014).