

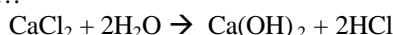
Cold Rid – Exothermic Reactions

Math / Chemistry
Middle / High
Regressions / Data Collection

Introduction: Chemicals are used in everyone's household for a variety of purposes from cleaning solutions to bug repellents to cooking sprays. Some of these chemicals are potentially lethal, while others are less threatening. One of these chemicals used commonly is calcium chloride. Calcium chloride is a desiccant; it attracts and absorbs water. It is used to absorb humidity from closets to help control mildew. If a small amount of calcium chloride is added to water, the calcium chloride atom will dissociate in a calcium atom and a chloride atom.

The compounds on the left of the equation are reactants, and the products are the result of the reaction on the right of the equation.

The balanced chemical equation is...



Objectives: Students will be able to...

1. Collect data by following an experimental procedure.
2. Input data in a graphing calculator.
3. Compare results.
4. Draw conclusions.
5. Determine the governing math model
6. Discuss applications of results.

Related Key Words: exothermic reaction endothermic reaction
single replacement reaction double replacement reaction
hydrophilic synthesis reaction

Materials: Plastic Cup half filled with room temperature water.
3 oz. Calcium Chloride ("DAMP RID")
CASIO CFX-9850G Color Graphing Calculator
CASIO EA-100 CASIO Data Collector (CDA)
Temperature Probe (Included with the CDA)
Link Cord (Included with the CDA)

Purpose: To record the change in temperature of the water as we add the Calcium Chloride and record and graph the results.

STEP 1— With the CDA turned off, insert the Temperature probe into the Channel One port on the top of the CDA and turn on the CDA.

STEP 2-- Press the Yellow SHIFT key followed by the mode key on the CDA. This enables you to set up the parameters of the experiment. The first thing that appears is a choice to set the time between when the data points can be collected. To view these different times press the DATALOG key to scroll through the times; these range from 10 msec to 60 seconds. There is also a choice of .000, this allows you to record a data point whenever you press the trigger key, and this is not dependent on time. Set this parameter for 500 msec and press the TRIGGER key to fix the setting.

STEP 3-- The next parameter you will need to set is the total number of samples you will be collecting. By pressing the DATALOG key you will scroll through the values, these vary from 10 to 200, set the parameter to 50 and press the TRIGGER key to fix the choice.

STEP 4--

The last parameter you will need to set is the time setting. This setting has three choices. The first choice is ZERO (0); this is used for real time data collecting and should only be used in conjunction with a program in the calculator. The second choice is ONE (1), this is the choice that you should use whenever you are collecting data and the CDA does not have to be collected to the calculator. This will give you the time readings in relative time. The third choice is two (2); this is the absolute time setting and is used in conjunction with a program from the calculator.

STEP 5--

At this point, you should have a temperature reading on your CDA. If you do not repeat steps 1-4. If you do have a reading and the word "READY" appears on the left side of the screen, place the temperature probe into the water and allow it to attain a stable temperature. (The temperature reading on the CDA should not change much.)

STEP 6--

As soon as the temperature is stable, pour in the Calcium Chloride into the water and begin to stir it using the TEMPERATURE probe. At the same time have your partner press the trigger key to begin collecting the data. With the parameters you have chosen, you will be collecting data for 25 seconds. You be able to see the temperature rise on the screen of the CDA. When the temperature are finished being recorded, the word "DONE" will appear on the screen. To repeat the experiment using the same parameters press the SHIFT RESTART key. (NOTE: This will delete the data from the previous sampling.)

Dave Barron of Casio, Inc. developed this activity.

Questions and Problems:

Level 1: Answer the following questions in complete, well-structured sentences.

1. How would describe the shape of the curve of the data?
2. What type of reaction is this: $\text{CaCl}_2 + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + 2\text{HCl}$?
3. What might be some of the dangers if someone where to swallow "Damp Rid"?
4. Discuss other applications that a desiccant could be used for other than mildew control.

Level 2:

1. What are the names for Ca(OH)_2 and HCl ?
2. How might stirring effect the results of the experiment? What if one group stirs their solution faster than another does, how will this effect a comparison of each group's data?
3. Is the reaction an exothermic or endothermic reaction? Support your conclusion with data.
4. Explain how the temperature of the water might effect the experiment.

Extension:

Have students explore how the temperature changes with different ratios of water and calcium chloride. What ratio gives the greatest temperature change?