

## HOT & COLD REACTIONS

### PRE LAB DISCUSSION:

Chemistry is the study of matter, energy, and change. This experiment will focus on energy. Chemical reactions can be endothermic or exothermic. The chemist not only needs to know whether a reaction takes in energy or gives off energy but also needs to know exactly how great the energy change will be per mole of reactant. The chemist can better control the reaction by limiting the total amount of reactants and by regulating the flow of energy into or out of the reaction vessel. For example, chemical engineers often design elaborate cooling systems for commercial size reacting vessels.

**CHEMICALS/EQUIPMENT:** Sodium hydrogen carbonate, zinc, acetic acid, 1M hydrochloric acid, sodium hydroxide, calcium chloride, graduated cylinder, balance, thermometer, test tubes, forceps

**Empty chemicals created in each step into labeled containers. Rinse test tube down drain with 10 times amount of water after each procedure.**

### PROCEDURE

#### ***PART I***

1. Place 5 ml of acetic acid in a test tube, and determine and record its temperature.
2. Take a pencil eraser sized amount of sodium hydrogen carbonate.
3. Place the sodium hydrogen carbonate in the test tube and record the temperature immediately after the reaction is completed.

#### ***PART II***

**CAUTION- use a forceps to handle sodium hydroxide flakes!!!**

1. Place 5 ml of water in the test tube and determine and record its temperature.
2. Take 1 flake of sodium hydroxide.
3. Place the sodium hydroxide in the test tube and stir gently. When the flake has dissolved, determine and record the temperature.

#### ***PART III***

1. Place 5 ml of 1 M hydrochloric acid in the test tube and record the temperature.
2. Take a pencil eraser sized amount of granular zinc.
3. Place the zinc in the test tube and when the reaction is complete, record the temperature.

#### ***PART IV***

1. Place 5 ml of distilled water in the test tube and record its temperature.
2. Take a pencil eraser sized amount of calcium chloride.
3. Place the calcium chloride in the test tube and when the reaction is complete, determine and record the temperature.

## DATA and CALCULATIONS

	ml of water or solution	initial temp.	final temp	temp change	Exothermic	Endothermic
part I	_____	_____	_____	_____	_____	_____
part II	_____	_____	_____	_____	_____	_____
Part III	_____	_____	_____	_____	_____	_____
Part IV	_____	_____	_____	_____	_____	_____

## THINKING SCIENTIFICALLY

( you may need to do some research to answer these questions, textbook/internet/etc.)

1. Which parts of the experiment were exothermic reactions and which parts were endothermic?
2. It has been said that endothermic reactions are inherently safer than exothermic reactions. Write a **paragraph** to explain why this is so.
3. Two reactions can give off the same amount of heat energy but one reaction may be far more explosive then the other. Write a **paragraph** or more to explain what other things a chemist should know about a reaction in order to devise a safe procedure.