Name: Period:

**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. Exothermic- the word describes a process that releases energy in the form of heat. Forming a chemical bond releases energy and therefore is an exothermic process. Exothermic reactions usually feel hot because it is giving heat to you. Endothermic - a process or reaction that absorbs energy in the form of heat. Breaking a chemical bond requires energy and therefore is Endothermic. Endothermic reactions usually feel cold because it is taking heat away from you. 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.

Heat energy is measured in a unit called calories. A calorie is the amount of heat needed to raise one gram of water one degree Celsius. The energy value of food is measured in kilocalories. Nutritionists use the word *Calorie* with a capital C instead of using the term *kilocalorie.*

**CHEMICALS**

Sodium hydrogen carbonate [baking soda] Zinc [mossy],

Acetic Acid [vinegar] 1M Hydrochloric Acid Sodium Hydroxide [lye]

**PROCEDURE**

***PART I***

1. Place 50mL of acetic acid in a styrofoam beaker. Determine and record its temperature using the SPARK with a stainless steel thermometer.

2. Weigh out 2g sodium hydrogen carbonate on the electric balance, make sure to use weigh paper.

3. Place the sodium hydrogen carbonate in the styrofoam beaker. Determine and record the temperature of the system immediately after the reaction has completed reacting.

***PART II***

***CAUTION- Do not touch with hands; use a scoopula to handle sodium hydroxide pellets.***

1. Place 50mL of water in the Styrofoam beaker. Determine and record its initial temperature.

2. Weigh out 2g sodium hydroxide.

1. Place the sodium hydroxide in the Styrofoam beaker and stir gently. When all of the pellets have dissolved, determine and record the highest final temperature.

***PART III***

1. Place 50mL of lM hydrochloric acid in the Styrofoam beaker. Determine and record its initial temperature.

2. Weigh out 2g sodium hydroxide.

3. Place the sodium hydroxide in the beaker and stir gently. When the reaction is completed, determine and record the highest final temperature.

***PART IV***

1. Place 50mL of 1 M hydrochloric acid in the Styroform beaker. Determine and record its initial temperature.

2. Weigh out 0.5g zinc.

3. Place the zinc in the Styrofoam beaker. When the reaction is complete, determine and record the highest final temperature.

**DATA**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Initial Temperature** | **Final Temperature** | **TemperatureChange** |
| **Part I** |  |  |  |
| **Part II** |  |  |  |
| **Part III** |  |  |  |
| **Part IV** |  |  |  |

**CALCULATIONS**

Calculate the energy produced for each part. Solve using the eqution: Q=mCΔT
For this lab, the Specific Heat (C) is 4.18J·g/oC, and the mass (m) is equal in grams to the volume used in milliliters. Show all work.

**QUESTIONS**

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. 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. Explain what other things a chemist should know about a reaction in order to devise a safe procedure.