# Lab: Endothermic and Exothermic Reactions

**Students: Please read the following information given below, and then come to class on your lab day with the following already prepared in your notebooks:**

1) Date, 2) Partner, 3) Title, 4) Purpose, 5) Materials, 6) Safety,
7) Procedures/Observations, and 8) Data/Calculations (collect data in your notebooks).

**In this lab, you will be required to make up your own data/calculations tables. Read the steps carefully to see what data should be collected. Be sure to make neat and organized data tables in your notebooks. Later, print out the Data and Calculations section on page 3 along with the Questions on page 4 and complete them after the experiment. The data, calculations, and questions will be due one week after performing the lab in class (your next lab class). No formal lab report is necessary.**

## Background:

Some chemical reactions absorb heat from the surroundings, resulting in a cooling of the surroundings (Endothermic Reactions). Some chemical reactions evolve heat, resulting in a warming of the surroundings (Exothermic Reactions).

## Examples of Endothermic and Exothermic Processes:

Photosynthesis is an example of an endothermic chemical reaction. In this process, plants use the energy from the sun to convert carbon dioxide and water into glucose and oxygen. This reaction requires 15MJ of energy (sunlight) for every kilogram of glucose that is produced:

$$\text{Sunlight (15MJ)} + 6CO_2(g) + 6H_2O(l) = C_6H_{12}O_6(aq) + 6O_2(g)$$

An example of an exothermic reaction is the mixture of sodium and chlorine to yield table salt. This reaction produces 411 kJ of energy for each mole of salt that is produced:

$$Na(s) + 0.5Cl_2(s) = NaCl(s) + 411\ kJ$$

**Experiment #1:**
A large test tube should be half filled with water and then placed in a test tube rack. Using a thermometer, the temperature of the water should be measured and recorded. Using a massing cup, approximately 10 g of ammonium chloride should be massed out. This amount should then be added to the half filled test tube of water. A rubber stopper should then be affixed to the test tube. The test tube should then be shaken for 30 seconds. The stopper should be removed and the temperature of the solution should be measured and recorded. Determine the change in temperature for this reaction.

**SAFETY: Ammonium is a severe irritant! Keep open test tube at arms length and open windows.**

**Experiment #2:**
A large test tube should be half filled with water and then placed in a test tube rack. Using a thermometer, the temperature of the water should be measured and recorded. Using a massing cup, approximately 5g of calcium chloride should be massed out and then added to the water in the test tube. A rubber stopper should then be affixed to the test tube. The test tube should then be shaken for 30 seconds. The stopper should be removed and the temperature of the solution should be measured and recorded. Determine the change in temperature for this reaction.

At the completion of this lab, all solutions should be flushed down the drain with excess water.

Name_____ Date_____
Period_____ Lab Group #_____

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**Experiment #1:**

**Data/Calculations:** Using a ruler, draw your own data table below, enter in data, and then calculate change in temperature.

**Experiment #2:**

**Data/Calculations:** Using a ruler, draw your own table below, enter in data, and then calculate change in temperature.

Name_____ Date_____

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**Questions:** Answer in complete sentences and properly cite references used.

1. In Experiment #1, was this an endothermic or exothermic reaction? _____
   a. What occurred that made you think so? Explain thoroughly

2. In Experiment #2, was this an endothermic or exothermic reaction? _____
   a. What occurred that made you think so? Explain thoroughly

3. State whether the following physical and chemical changes are endothermic or exothermic.

   a. melting _____ d. fusion_____

   b. vaporization_____ e. freezing_____

   c. condensation_____ f. combustion_____

4. Distinguish between endothermic and exothermic processes. Give at least three examples of each that you encounter in everyday life.