## Intro to Energy

*Thermodynamics* is the branch of science that studies the energy changes that occur during chemical reactions. These energy changes help explain why chemical reactions occur.

During the course of all chemical reactions, energy is either absorbed or released. Energy is often measured in a unit called calories.

## Important! A "scientific" calorie (lower-case c) is different than a Nutritional Calorie (upper-case C) – the ones you see on food labels. There are 1000 calories in 1 Calorie. Yes, it is confusing – sorry – if it were up to me I would change it, but that is the way it is, so deal with it! ©

What is an **exothermic reaction**? Give an example of an exothermic reaction that is common in the winter.

What is an **endothermic reaction**? Give an example of an endothermic reaction that involves chewing gum.

How are **heat** and **temperature** different? (Jot down some notes to yourself about the water/food coloring demo to explain this).

What is a **calorie**?

The amount of heat that is absorbed or released during a reaction can be determined using the following equation:

## $q = mc\Delta T$

Where q=

Where m=

Where c=

Where  $\Delta T =$ 

What does a high "c" value mean? A low "c" value?

## **Examples:**

1) How many calories of energy are absorbed when 100 grams of liquid water are heated from a temperature of 80  $^{\rm 0}C$  to 90  $^{\rm 0}C?$ 

2) How many calories of energy are released when 50 grams of iron are cooled from a temperature of 75  $^{\circ}$ C to a temperature of 50  $^{\circ}$ C?

3) Sodium is heated from 100 °C to 202 °C. 762 calories of heat are absorbed during this time. Is the sodium a solid, liquid or gas? What mass of sodium was heated?

Okay...so you can solve energy equations...sounds very "chemistry" so far, but not very "Chemistry of Foods" yet, right? Here is how you can apply this to the Nutritional Calories stuff you see on the side of a food label.

What is a bomb calorimeter?

Let's say you eat one "serving size" of Doritos. How do they know many Nutritional Calories are contained in that serving of Doritos?

4) Your pile of Doritos is placed in a dish under a soda can that contains 75 grams of water. If the temperature of the water changes from 22  $^{\circ}$ C to 92  $^{\circ}$ C as the Doritos burn...

a) How many scientific calories did the water absorb during this time?

b) How many scientific calories did the Doritos release, then? (Don't think too hard)!

c) How many Nutritional calories are contained in the Doritos?

5) You and your friends and sharing a frozen pizza. You eat a few slices. Let's say your pizza slices are placed in a dish under a container that contains 4550 grams of water. If the temperature of the water changes from 25  $^{\circ}$ C to 72  $^{\circ}$ C as the pizza burns...

a) How many scientific calories did the water absorb during this time?

- b) How many scientific calories did the pizza release, then? (Don't think too hard)!
- c) How many Nutritional calories are contained in the pizza?