

Determination of the Caloric Energy of a Cheeto®.



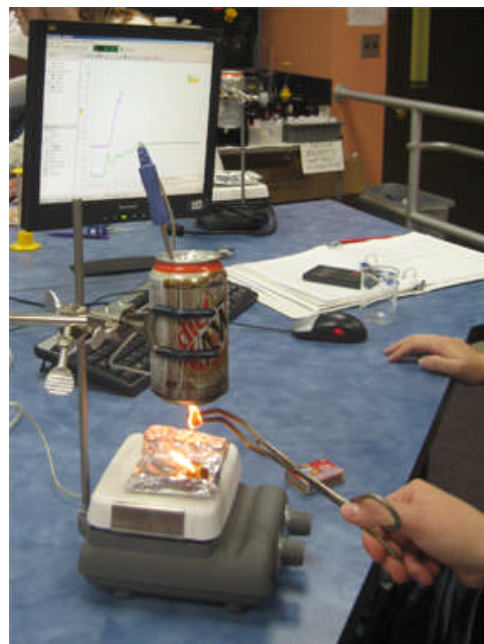
In this experiment we will burn a Cheeto® and use the fire to heat water. By measuring the change in temperature of the water we will calculate the number of calories absorbed by the water.

To measure the temperature change of the water we will use our temperature probes. We will put the water inside of an aluminum can. The specific heat of water is known. You will need to measure the mass of the water + can and the mass of the empty aluminum can to determine the mass of the water.

Because this experiment uses an open flame you will need to be careful and mindful of the fire. You will need to measure the mass of the Cheeto® before you burn it. You should also measure the mass of whatever ash remains when the fire goes out.

Read the package to determine the calories that are in a Cheeto®. Remember that food calories are actually kilocalories. 1 Calorie = 1000 calories.

When you write about this experiment in your laboratory notebook you will need to record your observations in detail and show your calculations. In your conclusions it is important to compare your results to the results you might expect if the heat transfer was ideal (no heat lost to the surroundings). Write about any aspects of this experiment that would affect the results.



To determine the calories/gram theoretical (from the Cheeto® package information) find out how many **C**alories are in a serving and the mass (in grams) of a serving. Calculate **C**alories per gram and then multiply by 1000 to find *calories per gram theoretical*.

To find the calories/gram experimental use the following equation:

$$q \text{ calories} = \text{mass water} \times \text{S.H. water} \times \Delta T \text{ water}$$

These are the calories that are transferred to the water from the burning Cheeto®. Express this energy in terms of the grams of the Cheeto® that you burned. In other words, divide this number of calories by the mass of your Cheeto®.

You now have two results - the theoretical calories/gram and an actual calories/gram. Answer the following questions.

1. What is the efficiency of the heat transfer from the Cheeto® to the water?

(experimental heat/gram / theoretical heat/gram) X 100%

2. Comment on this efficiency - if heat is not created or destroyed then where did it go? What other types of heat transfer occur in this experiment?

3. Look at the ingredients in the Cheeto®. Which ingredients do you think have the most energy? From the ingredients - what do you think is burning?

4. What color was the ash that was left over after the fire when out?

5. What element do you think composes this ash? Give reasons for your answer.

6. How could you improve this experiment and the efficiency of the heat transfer to the water?

Answer these questions in your laboratory notebook. You should also comment on any observations you made.