# LAB: Energy Content of Foods

· All human activity requires "burning" for energy. You use food as fuel for your body. Food contains the stored energy you use to walk, run, think, and so on.
· You cannot directly measure the energy contained in food. However, you can calculate the amount of thermal energy released as a sample of food is burned by determining the thermal energy absorbed by water heated during the burning of the sample.

Energy released = energy absorbed
Energy absorbed = temperature change of water x mass of water x specific heat of water

$Q = m \times C \times (T_f - T_i)$

· In this experiment, you will determine the energy released as various foods, such as marshmallows and cheetos, burn. You will look for patterns in the amounts of energy released during burning.

## *Materials*

Thermometer two food samples Graduated cylinder
Wooden splint utility clamp Matches
Ring stand test tube paperclip
Food holder cold water

FIGURE 22-1

## *Procedure*

1. Straighten the paper clip and insert it through the food sample. Position the paper clip on the edges of the aluminum container as shown in figure 22-1.
2. Use the balance to determine the mass of the pan, paper clip, and food sample. Record the mass in Table 1
3. Use the graduated cylinder to add 25 ml of water to the test tube. Use the thermometer to measure the initial temperature of the water. Record this value in Table 1.

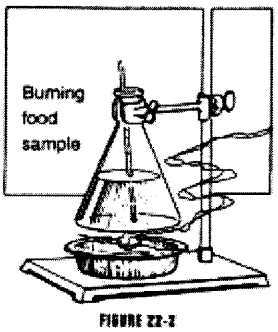

FIGURE 22-2

4. Ignite the wood splint with a match. **CAUTION**: *Always use care with fire*. Use the burning splint to ignite the food sample. Once the food sample is burning, safely extinguish the splint. Quickly, position the aluminum container under the flask as shown in figure 22-2. The water in the flask should absorb most of the heat released by the burning food.
5. Stir the water with the thermometer. The thermometer should not touch the bottom of the test tube. Observe the temperature rise. Record the highest temperature of the water as the final temperature.
6. Allow the aluminum container and its content to cool. Determine the mass of the container and contents after the release of energy. Record this value in Table 1.
7. Repeat the procedure with a second food sample. Use a new 50 ml portion of cold water.
8. When you are done, place burned food, used matches, and partially burned wooden splints in the container provided by the teacher.

## *Data and Calculations*

*table 1*

| **Food Type** | | _____ | _____ |
|---|---|---|---|
| Initial mass of food and container | *** | g | g |
| Final mass of food and container (after burning it) | | g | g |
| Mass of food burned (initial mass – final mass) | | g | g |
| Mass of water (how much water in flask?) (ml of water = g of water) | *** | g | g |
| Initial temperature of water, $T_i$ | *** | °C | °C |
| Final temperature of water, $T_f$ | | °C | °C |
| Temperature change, $\Delta T$ ($T_f - T_i$) | | °C | °C |

*** *Fill out before starting to burn food sample!*

**Calculations – SHOW WORK!**

| | | |
|---|---|---|
| 1) Heat absorbed <u>by the water</u><br>$q = m \times C \times \Delta T$<br>(C of water = 1 cal/g·C°) | cal | cal |
| 2) Heat released by the food<br>(heat absorbed by water = heat released by food) | cal | cal |
| 3) Energy content of food / grams<br>(heat from step #2 / mass of burned food)<br>**1 Calorie = 1000 calorie** | cal/g | cal/g |
| 4) Energy content express in Calorie per grams<br>(step #3 divided by 1000) | Cal/g | Cal/g |

## *Questions and Conclusions*

1. One of the foods in the experiment has a high fat content (cheetos) and the other have a high carbohydrate content (marshmallows). Looking at your class results, what generalization can you make about the relative energy content of fats and carbohydrates? Which food sample released the most energy?