Calorimeter Lab

Discussion

As you probably know, gaining weight is usually a result of the large number of calories present in the foods that we eat. A “calorie” is the unit scientists use to measure the energy content of foods. The expression “a well-balanced meal” is used to tell us that one is receiving the right amounts and kinds of nutrients in their food, as well as limiting the number of calories present.

The major food groups include: fats (lipids), carbohydrates, and proteins. Fats contain more energy (calories) than an equivalent amount of protein or carbohydrate. However, our body has more difficulty releasing energy from fat than from sugar (carbohydrate).

To determine the amount of energy present in a food sample, a special instrument called a CALORIMETER is used. The calorimeter measures the amount of energy released from a food sample in the form of heat. Using a simple form of calorimetry, you will be able to compare the caloric content of various food samples.

## Materials

Large metal can (calorimeter) Wooden cork Thermometer

Distilled water Harge test tube/tape Matches Hammer/large nail/tin snips 10 ml graduated cylinder String

Triple Beam balance or scale Burnable food samples Pin

## Procedures

1. Using a large metal can, construct a calorimeter. A coffee can or any other large, metal container would be suitable. After removing the top, cut out a pie-shaped piece along the side and invert the can so that the bottom is upright. Carefully cut a hole wide enough to hold a large test tube. Puncture several holes around this opening. (*Refer to the diagram*).

cut here

1. Insert a pin in to a small wooden cork and place this under the can. Put 10 ml of water into the test tube and position it in the can (through the hole) so that the bottom is approximately 2 cm above the pin. Once you have positioned the test tube, remove the cork and pin from under the can. You are now ready to use the calorimeter to determine the calorie content of a food sample.
2. Weigh 0.2 grams of a food sample that is easy to burn, and insert the food into the pin. (peanuts, marshmallow)
3. Place a thermometer into the test tube and record the temperature of the water.
4. Ignite the food sample with a match; once it is burning, carefully place the cork and pin under the test tube in the calorimeter. If you have difficulty in igniting the food sample, you can use a very small piece of string as a wick. Mold the food sample around the string, and then ignite the string. You may have to repeat this process several times before you are successful in igniting the food.
5. After the sample has burned completely, observe the temperature of the water again.
6. A calorie is defined as the amount of heat required to raise one gram of water one degree Celsius.

## Calculations and Data

1. Determine the number of calories in your food sample, inserting your data into the following equation:

Calories = volume X (final temperature – initial temperature)

1. Complete the following chart using you results (do not fill in the last column):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Food Sample | Mass (g) | Temperature Change (oC) | calories | Calories | Calories in 1g |
| A |  |  |  |  |  |  |
| B |  |  |  |  |  |  |
| C | A)  B)  D) |  |  |  |  |  |
| D |  |  |  |  |  |  |

### Conclusions and Questions

1. Are you surprised by the large number of calories that your small food sample contained? There are actually two kinds of calories – scientific ones and ones used in diets. A food calorie (**C**alorie) contains 1000 **c**alories of energy. Now, return to the chart you made and fill in the last column (Calories).

2. Why was 0.2 grams used for each sample? Why didn’t we use any weight for a sample to determine the amount of heat it produces?

3. Which of the food samples contained the most energy? Does this mean that the food sample contained the most nutrition? Explain.

4. About how many Calories does a normal person need every day?

Taken from “Chemistry Around You” by Salvatore Tocci, p. 33