

Sec.: _____ Name: _____

Experiment: Measuring Food Energy
(B. Science 10-38-1b)

Purpose: To construct a simple calorimeter and use it to measure the amount of heat energy contained in certain foods.

Materials: ring stand test tube clamp
test tube paper clip cork stopper
metric ruler 3 food samples mass balance
50 mL graduated cylinder matches thermometer

Methods:

1. To assemble a calorimeter, set up a ring stand, test tube as shown in the figure.

2. To make a food platform for the calorimeter, bend the outer end of a paper clip straight down so that it is at a right angle to the rest of the clip. Insert the free end of the clip into the middle of the narrow end of the cork stopper. See the second figure.

3. Place the food platform on the metal part of the ring stand that will act as a fireproof pad. Adjust the height of the test tube so that the space between the food platform and the bottom of the test tube is 2 cm.

4. Use a graduated cylinder to measure exactly 15 mL of water into the test tube.

Record the mass of the water in the appropriate place in results. NOTE: Remember that 1 mL of water has a mass of 1 g.

5. Measure the temperature of the water in the test tube. Record this number in the appropriate place in the data table. NOTE: Be sure to remove the thermometer from the test tube after you record the temperature.

6. Select a food sample and find its mass using the triple- beam balance. Record the mass in results. Also record the name of the food sample used in the appropriate place in results.

7. Place the food sample on the paper clip platform. Ignite the food sample with a match, and quickly place the platform under the test tube. CAUTION: Wear safety goggles when doing this part of the investigation. Be careful when using matches. Allow the food to burn completely. Reignite the sample if necessary.

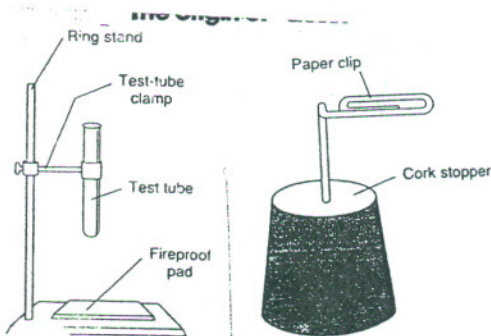
8. After the sample has burned completely, measure the temperature of the water in the test tube. CAUTION: Do not touch the test tube; it may be hot. Record the temperature of the water.

9. Find the mass of the remainder of the burned food sample. Record the mass.

10. Determine the change in mass of the food sample. Record the result.

11. Determine the change in the temperature of the water in the test tube. Record the result.

12. Repeat steps 3 through 11 using two other food samples. NOTE: Remember to empty the water out of the test tube and to use cool water for each sample.



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13. Use the formula below to find the energy value, or calories, per food sample. Record the results in the appropriate place in the data table. NOTE: **The specific heat of water is 1 calorie per gram degree Celsius.**

$$\frac{\text{calories}}{\text{per food sample}} = \frac{\text{Change in water temperature}}{\text{Change in water temperature}} \times \frac{\text{Mass of water}}{\text{Mass of water}} \times \frac{\text{Specific heat of water}}{\text{Specific heat of water}}$$

14. Use the formula below to find the Calories per gram of food sample. Record the results in the appropriate place in the data table.

$$\text{calories per gram} = \frac{\text{calories per food sample}}{\text{change in mass of food sample}} \quad (\text{division})$$

Results:

variable	Food Samples		
food sample mass before burning (g)			lighter
food sample mass after burning (g)			13.00g
change in mass of food sample (g)			12.95g
mass of water (g) (1 mL = 1 g)			15g
temperature of water before heat (°C)			32°C
temperature of water after heat (°C)			46°C
change in water temperature (°C)			
calories per food sample			
calories per gram			

Conclusions:

1. What is the difference between a calorie and a Calorie?
2. Why must the food sample be ignited before placing the platform under the test tube?
3. Why must the thermometer be removed from the test tube when the food sample is burning?
4. How do your results compare to those of other student groups in your class. Give reasons for any variations. If it is done as a demonstration give some possible sources of error in this experiment.
5. Fats yield more food energy than proteins or carbohydrates. Which of your food samples most likely contained the greatest amount of fat?

Discussion:

1. Swimming for one hour burns up 600,000 calories. For each food sample you tested, calculate how many grams of food you would have to eat to get this energy. List the food sample and the number of grams needed.
2. Fad diets involve the consumption of large amounts of a limited variety of foods. Explain why some fad diets may be an unhealthy way to lose weight.
- 3a. This section of the chapter stresses the importance of water in our diet. Read John 4: 9 - 14. What did Jesus invite the Samaritan woman to do?
- 3b. What spiritual meaning did He want the Samaritan woman to gain?