ENERGY OF A PEANUT
AN EXPERIMENT IN CALORIMETRY

Teacher Notes

This experiment is designed for students working singly or in groups of two.

Energy of a Peanut is an experiment in calorimetry that uses the burning of food to generate heat measured rather than the traditional specific heat of metals or heats of reaction. The experiment is a simplified procedure of that which would be carried out in a bomb calorimeter. In a bomb calorimeter, the food is placed in the bomb which is then sealed and flushed with oxygen gas. The bomb is placed in the calorimeter and a spark source is used to ignite the food. The calorimetric information is calculated from the temperature changes of the system. This experiment generates a great deal of student interest.

CAUTION – HEALTH HAZARD: This procedure involves burning nuts. If any students are allergic to nuts, or have other food allergies, they should not remain in the laboratory and should be excused from this experiment. Inform students in classes in any adjoining laboratories.

The best foods to use are roasted mixed nuts, corn or cheese curls, potato chips, and tortilla chips. Although dry roasted nuts will work, along with "baked" snacks, they are more difficult to burn due to a lower fat content.

All food products used in this experiment should be available in their original packages with the labels intact.

Generally, it is the fat in the food products that is burning. If the experiment is carefully carried out, students should get results close to the label values for the calories from fat.

Make sure students place funnels over their graduated cylinders when pouring the water from the metal can. This will prevent pieces of ice from getting into the graduated cylinder.

ENERGY OF A PEANUT
DATA AND RESULTS

Name_____ Course/Section_____

Partner's Name (If applicable) _____ Date _____

Procedure 1. Energy of a Peanut

	Trial 1	Trial 2
Mass of peanut or _____ (type of nut used)	_____ g	_____ g
Mass of remaining material	_____ g	_____ g
Mass of peanut that burned	_____ g	_____ g
Volume of liquid water	_____ mL	_____ mL
Mass of liquid water (see calculations section)	_____ g	_____ g
Heat produced by peanut or _____ (type of nut used)	_____ cal	_____ cal
Heat produced by 1 gram of peanut	_____ cal	_____ cal
Kilocalories of heat from 1 gram of peanut	_____ kcal	_____ kcal
Serving size (from label)	_____ g	
"Calories" per serving size (from label)	_____ "cal"	
"Calories" per gram (from label)	_____ cal/g	

Show one set of your calculations in the space below:

Procedure 2. Energy of a _____
(food product used)

	Trial 1	Trial 2
Mass of _____	_____ g	_____ g
Volume of liquid water	_____ mL	_____ mL
Mass of liquid water	_____ g	_____ g
Mass of remaining material	_____ g	_____ g
Mass of _____ that burned	_____ g	_____ g
Heat produced by _____	_____ cal	_____ cal
Heat produced by 1 gram of _____	_____ cal	_____ cal
Kilocalories of heat from 1 gram of _____	_____ kcal	_____ kcal
Serving size (from label)	_____ g	
"Calories" per serving size (from label)	_____ "cal"	
"Calories" per gram (from label)	_____ cal/g	

QUESTIONS:

1. Why is it necessary to maintain a large excess of ice in the metal can?

   This reaction is run at constant temperature. The excess ice eliminates the need to calculate the heat absorbed by the metal can.

2. What errors do you encounter in this procedure and how do they affect the results (i.e., a large effect or a small effect)?

   Not all the heat from the burning food is absorbed by the metal can and its contents – this tends to be a small error.
   Build-up of carbon (soot) on the can absorbs heat – this may be a large error if the carbon layer is thick
   Burning sample falls off holder – may be a large error, depending on how long the sample burns after it falls

3. How does your value for the caloric energy of a peanut (or other food) compare to the label information?

   Values should be in a reasonable vicinity of the label information

4. Calculate the "calories per gram of fat" (from the label information) for the foods you tested. How do these values compare with your experimental values?

   Values generally are closer to the calories from fat values