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				
(food product used	1)			
	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 by the metal can.	e excess ice elim	inates the ne	ed to calculate	the heat absorbed
2. What errors do you encounter in this procedure and ho effect)?	ow do they affect	the results (i.e., a large effe	ct or a small
Not all the heat from the burning food is absorbed error. Build-up of carbon (soot) on the can absorbs head Burning sample falls off holder – may be a large	t – this may be a	ı large error	if the carbon la	yer is thick
3. How does your value for the caloric energy of a peanu	t (or other food)	compare to	the label inform	ation?
Values should be in a reasonable vicinity of the	label information	n		
4. Calculate the "calories per gram of fat" (from the labe compare with your experimental values?	el information) fo	or the foods y	you tested. How	v do these values

Values generally are closer to the calories from fat values