Energy Found in a Cheeto and a Marshmallow

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Introduction:

The energy that is found in food can be calculated through the heat it releases while it is being broken down. One form of measurement of energy is the calorie. The calories in food is actually 1000 calories in chemistry, the food calories is called the kcal or Calorie. The experiment is conducted to identify which type of food, a cheeto or a marshmallow, contains more energy and whether the information provided on the packaging is an accurate scale of how many calories are in the food item. This is done through the comparison of temperature (independent variable) and and the mass of the food burned (dependent variable). It will be able to be determined how much energy the food gives off and which gives off the most energy through the amount of degrees the temperature increases and how much mass is lost. When conducting the experiment the initial and final temperature of the water, the beginning and final mass of the food item and the mass of the water is to be recorded.
Based on the information on the back of the packaging of each food item, it can be assumed that the marshmallow will give off more energy.

Purpose: The experiment is conducted to identify which type of food, a cheeto or a marshmallow, contains more energy per gram.

Materials and Methods: - YOU CAN JUST LIST YOUR MATERIALS FOR THE GRADE 11 COMBUSTION LAB

For this experiment, a scale, a calorimeter (soda can), a cork and pin, a large graduated cylinder, matches, a cheeto, a marshmallow, thermometer or temperature probe, water, heat proof gloves and a glass stir rod will be needed. To begin the experiment the first food sample was placed on the food holder and its mass was measured and then recorded. A clean and dry pop cans mass was measured and recorded The graduated cylinder was used to obtain approximately 50 mL of water, which was then poured into the pop can this mass was also recorded and the original mass of the pop can was subtracted from this value to obtain the actual mass of the water, both the mass of the water and the pop can and the mass of only the water is noted. Then the pop can is suspended by a glass rod on top of a metal cylinder (figure 1). The temperature is inserted into the pop can and the initial temperature of the water is recorded, ensuring not to touch the metal of the can. The matches are used to light the food sample which is then placed under the pop can (figure 1) with the temperature probe in the water. The water is heated as the food sample is burned. Record the maximum temperature of the water once the food sample stops burning. Remeasure the mass of the food sample and record it. The initial mass is subtracted from the final mass to determine the mass burned and record it. This is then repeated with the second food sample.

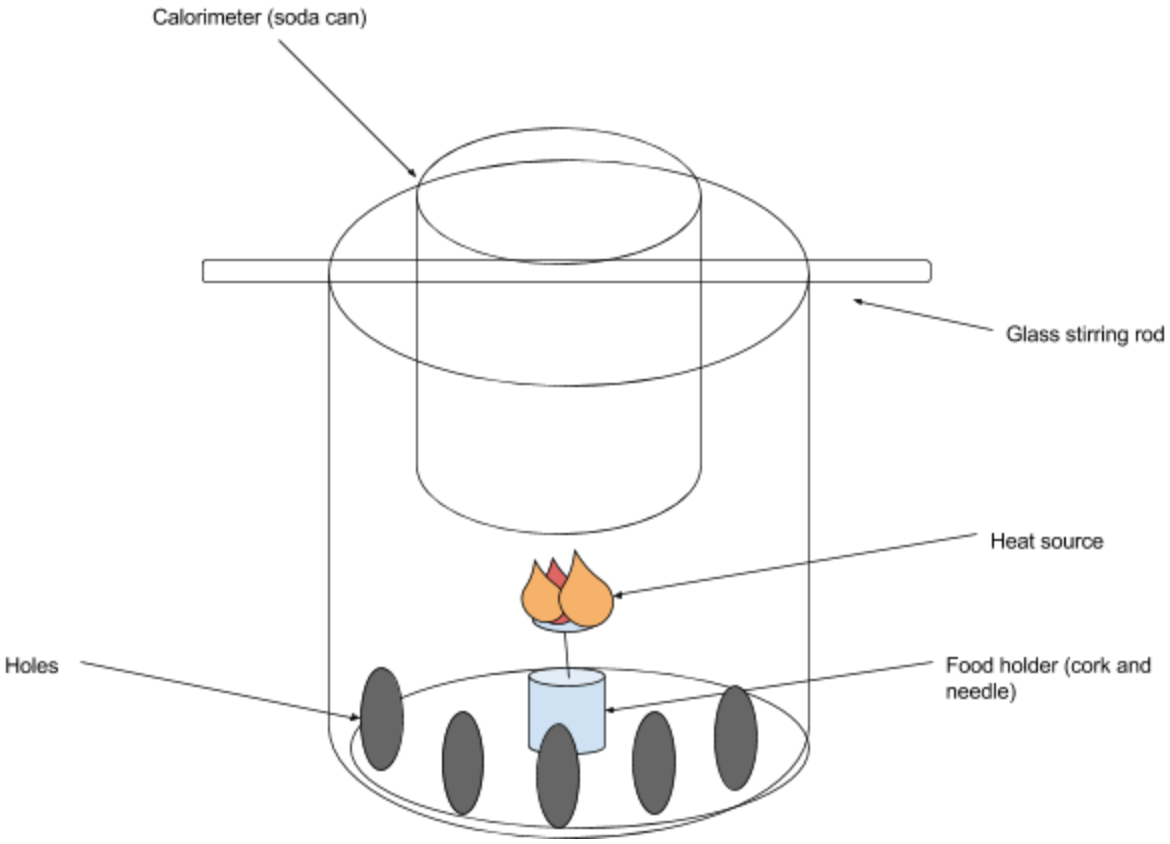

Figure 1: calorimeter used in the burning of various food items

Procedure: Copy and paste the reference that was shared with you here. No need to copy out the entire procedural step.

Data Table / Observations:

Table 1: data from packaging of each food sample.

Food sample	Cheeto	Marshmallow
Calories per serving	320	90
Grams per serving	57 g (1 package)	28g (approx 4 marshmallows)
Fats per serving	20 g	0g
Carbohydrates per serving	32 g	22g
Proteins per serving	3 g	<1 g

Table 2: all data recorded in the lab

Food Sample	Cheeto	Marshmallow
Initial mass of food (g)	5.32 g	7.62 g
Mass of pop can (g)	10.14 g	10.14 g
Mass of pop can with water (g)	58.69 g	58.48 g
Mass of water (g)	48.55 g	48.34 g
Initial temperature of water (℃)	21.7℃	21.7℃
Final temperature of water (℃)	30.6℃	32.7℃
Change in temperature (℃)	8.9℃	11 ℃
Final mass of food sample (g)	5.13 g	7.06 g
Mass of food sample burned (g)	-0.19 g	-0.56 g

<u>Calculations:</u>

In this lab the amount of mass burned of the food sample and the change in temperature directly relate to the amount of Calories that are in the food sample. Through multiple calculations using information gathered in the lab (Table 2) it is determined how many calories are in the food samples. The calculations below (Figure 2) show that the marshmallow gave off -2222.67 Joules of energy and contains 0.94 Calories/gram. The calculations also show that the cheeto gave off -1806.16 Joules and contains 2.3 Calories/gram.

Calculations used to determine the Calories per gram in each food sample.

% Error(cheetos)= [(Your value-actual value)÷actual value] x 100

=[(2.3-5.61)÷5.61] x 100

=-59.%

q(H2O)=mcΔt

=(48.55)(4.18)(8.9)

=1806.16

q(cheetos)= -1806.16

Cal/g= -1806.16÷4.182

=- 0.43÷-0.19

=2.3 Cal/g

% Error(marshmallow)= [(Your value-actual value)÷actual value] x 100

=[(0.94-3.21)÷3.21] x 100

=-70.7%

q(H2O)=mcΔt

=(48.34)(4.18)(11)

=2222.67J

q(marshmallows)= -2688.91

Cal/g=-2222.67÷4.182

=- 0.53÷-0.56

=0.94 Cal/g

<u>Answered Questions: Answer the 4 questions found on combustion lab in full sentences in this section.</u>

<u>Conclusion:</u>

From the data collected and the calculations done it was determined that the cheeto has the most energy and Calories/gram. This could be due to the fact that the cheeto contains more fat and protein in comparison to the marshmallow. This means that information supplied on the packaging of the food samples is fairly accurate in stating that the cheetos have more calories in it than marshmallows. A possible source of error may be some heat lost in the time it took to place the food sample under the calorimeter. The time that the food sample was not under the calorimeter there was heat lost that could affect the outcome of the calculations and thus the conclusion of the lab.