Name _____ Period _____

Lab 4 – Energy Content of Snack Foods 50 Points

Introduction

In this lab we are going to explore one of the applications of heat and energy, the energy content of food. Using calorimetry we will burn snack foods to release the heat energy, and use that energy in a tin can calorimeter to add the food's heat to water and indirectly determine the energy content of the food.

Organic Product Heat Content

All organic substances, from fossil fuels, crop food sources, to food source animals, produce energy when the structure of these foods break down over time. This energy is produced through the combustion reaction type:

$$\text{Food} + O_2(g) \rightarrow CO_2(g) + H_2O(g) + \text{Heat}$$

Food + Oxygen forms Carbon Dioxide Gas + Water Vapor + Energy

The heat (*q*) produced by the food makes the food exothermic (*producing heat*). That heat is then used to *power* functions in biological organisms (*animals, humans, plants, etc*.) and other applications requiring heat. This heat can be measured through the standard calorimetry process:

$$q_{Food} = -\, q_{water} \quad q_{water} = c_{water} \cdot m_{water} \cdot (T_{final} - T_{initial})$$

The change in temperature (ΔT) is measured due to the heat transfer, and along with the mass and specific heat of the water the heat of the water (q_{water}) , thus the heat of the food (q_{food}) can be calculated. To find the heat per gram for a food source the following equation is used:

$$q_{Food/g} = q_{Food} / Mass_{Food}$$

Food sources are often measured in Calories per gram, where Cal is measured as kilocalories (*kCal*)

Lab Procedure

Setting Up Glass Beaker Calorimeter

1. Obtain a ring stand with ring attached, 250mL beaker, a stirring rod, aluminum foil, thermometer, and a pair of beaker tongs.
2. Add 50mL of water to the beaker using the marks on the beaker. (50mL of water = 50g of water)
3. Wrap the sides and top of beaker with aluminum foil. Leave the bottom of the beaker exposed. The exposed glass is where the heat will be transferred between the chips and container.
4. Place beaker on the ring stand and wire mesh.
5. Slide thermometer through the thermometer mount on the ring stand, then push the thermometer through the top of the foil into the beaker and into the water.

Performing the food heat analysis

6. Obtain 3 – 5 Cheetos (*or similar*) chips from the bag. Do not eat the chips… we are testing the energy content, not how tasty the chips are!
7. Obtain a piece of aluminum foil and place foil on balance, removing weight with the tare button. Weigh the chips on the scale and write mass on data table.
8. Record the temperature of the water (T_{ini}) with the thermometer and record on the data table;
9. Place the aluminum foil with the chips under the beaker/ring stand setup. Lower the ring with beaker low enough so the chip are sitting right above the chips.
10. Use a match to light the chips on fire… do not light anything else on fire including your hair, papers, or other students;
11. As soon as the fire stops record the new water temperature (T_{final}) and record on data table
12. Remove foil from beaker, empty water in the sink, and discard beaker and chip bags.

Name _____ Period _____

Lab 4 – Energy Content of Snack Foods 50 Points

Lab Data Table

Mass Water	Mass Chips	$T_{initial}$	T_{final}	q_{water}	q_{chip}

Calculations

ΔT	$\Delta T = T_{final} - T_{ini}$	q_{water}	$q_{water} = c_{water} \cdot m_{water} \cdot \Delta T$ $c_{water} = 4.184 J/g^oC$
q_{chip}	$q_{chip} = -q_{water}$	c_{chip} (*Heat Capacity*)	$c_{chip} = q_{chip} / m_{chip}$