FLINN SCIENTIFIC

Name____

Calorimeter Worksheet

Introduction to the First Law of Thermodynamics

Data Table

Peanut Sample	Initial Mass of Cork/Pin/Peanut Assembly	Initial Temperature of the Water	Final Temperature of the Water	Final Mass of Cork/Pin/Peanut Assembly
1				
2				
3				
4				
5				

Analysis and Calculations

1. Determine how much of the peanut burned by subtracting the final mass of the cork/pin/peanut assembly from the initial mass. Record in the Results Table. Do not forget to include the appropriate units.
2. Determine the change in temperature of the water by subtracting the initial temperature from the final temperature ($T_f - T_i$). Record this in the Results Table.
3. Now, calculate the heat gained by the water using Equation 1. The specific heat of water (c) is 1.0 cal/g•°C. Assume the density of water is 1.0 g/mL. The mass can be calculated by multiplying the volume of water and the density of water ($m = V\rho$).
4. Divide the heat gained by the water by the change in mass of the peanut. Record this as heat per unit mass in the Results Table with the proper units.
5. Calculate the average heat per unit mass.

Results Table

Peanut Sample	Change in Mass	Change in Temperature	Heat Gained by the Water	Heat per Unit Mass
1				
2				
3				
4				
5				

Average Heat per Unit Mass:____________________

Post-Lab Questions

1. Heating is required to melt ice or boil water. However, the temperature of the substances remain the same at 0-°C and 100-°C, respectively. Why does the temperature remain the same? Where does the heat go?

2. Why do some foods have more caloric content per unit mass than other foods? *Hint:* Think about the caloric content of fats, carbohydrates and proteins.

3. A "perfect" calorimeter is one that completely reflects all the heat energy so that it does not absorb any heat. This way, all the heat energy will be transferred to the water and the energy given off can be accurately calculated. From your observations from step 13 in the procedure, is this calorimeter perfect? Why or why not? How does this effect the measurement of the heat gained by the water compared to the actual heat released by the burning peanut? List some other possible errors associated with this setup.

4. How much heat is required to increase the temperature of a lake by 2.0-°C that has a total volume of 4.0 trillion (4.0×10^{12}) liters (approximately 1 cubic mile of water)? Assume the specific heat of the lake water is 1.0 kcal/kg·°C, and the density of the lake water is 1.0 kg/L. On average, how many grams of peanuts would it take to generate this much heat?