

4C – ENERGY FROM FOOD

Analysis

Table 1 – Food and Water Data

Item	Initial mass of dish+food, m_i (g)	Volume of Water (mL)	Final mass of dish+food, m_f (g)	Initial temp., T_i (°C)	Final temp., T_f (°C)

1. Transfer names of food items to Table 2.
2. Use the volume of water to determine the mass of water used for each food item in Table 2. The density of water = 1.00 g/mL.
3. Determine the change in temperature of the water by subtracting initial temperature from final temperature, $\Delta T = T_f - T_i$. Record this value in Table 2.

Table 2 – Food and Water Calculations

Item	Mass of water (g)	Temp. change (°C) $\Delta T = T_f - T_i$	Overall energy (J)	Overall energy (cal)	Overall energy (Cal)	Mass of food burned (g)	Calories per gram snack (Cal/g)

4. Heat (in Joules) produced equals heat absorbed by the water, calculated with the following equation:

$$q_{\text{water}} = m_{\text{water}} \times C_{p, \text{water}} \times \Delta T_{\text{water}}$$
 Calculate the heat absorbed by water for each food item. Use 4.18 J/g·°C for the specific heat of water, and use the change in the temperature of the water from Table 2. Show your work in the space below. Include units and record the results of your calculations in Table 2.

5. Use the same equation for the heat of water, q , to solve for energy absorbed by water in calories for each food item. Use $1.00 \text{ cal/g}\cdot^{\circ}\text{C}$ for the specific heat of water. Show work, include units, and record answers in Table 2.

6. Convert calories to Calories. There are 1,000 calories in 1 Calorie. Record Calories for each food item in Table 2.

7. Determine the amount of food mass burned by subtracting final mass from initial mass, $m = m_I - m_F$. Record this value for each food item in Table 2.

8. Determine the amount of energy each food item provides in Calories per gram (Cal/g) by dividing Calories by mass of food burned. Record this value in Table 2.

Questions

1. Which of the substances provides the most Heat/Food Calories? Explain how you determined your answer.

2. Identify two flaws in the experiment design that could have contributed to error. How would you re-write the procedure or change materials to minimize error from these flaws?

3. Was the burning of the chip an endothermic reaction or an exothermic reaction? Explain how you came to this conclusion.

4. If you needed to generate 12,343 joules of heat energy, how much of each item would you need? Show work and include units.