

Student Sheet

Name: _____ Period: _____

TITLE: ENERGY IN BONDS

PURPOSE:

To see how to test for calories in food and to see which types of food have the most calories.

INTRODUCTION:

Plants have evolved processes that convert light energy into the chemical bonds of complex molecules. The chemical bonds in carbohydrates, fats, and proteins store energy until needed by the plant. The plant can then release the energy by breaking the appropriate chemical bonds. Every animal maintains its life processes by consuming complex molecules that store energy. The processed plants and animals we eat as foods contain varying amounts of proteins, carbohydrates, and fats. Because each of these types of foods contains varying amounts of energy, these foods will release varying amounts of energy when they are used by cells. Within our bodies, the energy is released slowly by a series of chemical reactions.

PRE-LAB PREPARATION:

By burning pieces of food, the chemical energy stored in molecular bonds is released as heat and light. The heat can be measured in units called **calories**. A calorie is the amount of heat (energy) required to increase the temperature of one gram of water by one degree C. This process is the basis of the technique of **calorimetry**.

The more calories a food contains, the more heat is given off when burned. Foods high in calories will release large amounts of energy. One gram of a protein will release far fewer calories than one gram of fat. You will study foods with different proportions of protein, fats, and carbohydrates to see how much energy (calories) they release.

MATERIALS:

can, wire stand, flask, pin, foods, alcohol burner, splint, thermometer, balance



PROCEDURES:

1. Set up apparatus.

2. Mass a small chunk of food. Place it on the pin.
3. Record the temperature of 100 ml of water in the flask.
4. Light the food with the splint. Wait until it quits burning.
5. Record temperature of water.
6. Re-mass the food.
7. Repeat for 3 fats and 3 carbohydrates.

PREDICTION: Which food will have the most calories per gram?

DATA:

Food	Mass 1	Mass 2	Change in Mass	Temp 1	Temp 2	Change in Temp	Calories	Cal/gram

CALCULATIONS:

$$\text{Calories of sample (energy given off by sample)} = \frac{(\text{mass of water}) \times (\text{chg in water temp})}{1000\text{g}}$$

$$\text{Calories/ chg in mass} = \text{Cal / g}$$

ANALYSIS:

1. Which food had the most calories? the least?
2. In general, which foods (carbohydrates or fats) had more calories?
3. Look in your book and draw the basic molecular structure for a carbohydrate and for a fat or lipid.
4. Which has more atoms? more bonds?
5. What function do each of the macromolecules serve in our cells?
6. Which elements seems to be most common in the macromolecules?

CONCLUSION: Summarize 2 things you learned in complete sentences.