Name: _____ Date: _____

Burning Food to Count Its Calories

Circle group

Food labels list calories. But what is being counted? A calorie is a unit of energy. The Calorie on a label is really the larger unit, the kilocalorie. It equals a thousand small calories. One small calorie is about the energy it takes to warm one gram of water by one degree Celsius.

To measure the energy in food, scientists use a device called a bomb calorimeter. They seal a small dried bit of the food in a strong steel chamber. The chamber is full of oxygen. An electric spark lights the food. The chamber sits in a known amount of water. When the food burns, it gives off heat. The water warms up, and a thermometer shows how much. Since the amount of water is known, the change in heat tells how much energy the food gave off.

But the body is not a furnace. Digestion does not get every bit of energy out of food. Fiber, for example, mostly passes through. In the late 1800s, an American chemist named Wilbur Atwater studied how much usable energy people really get from food. His work gave us averages we still use. Protein and carbohydrate give about four Calories per gram. Fat gives about nine. Labels use these averages. So the numbers are close guesses, not exact.

Calories are only part of nutrition. Two foods can have the same count but different vitamins, minerals, and fiber. Food gives energy. It also gives the body what it needs to grow and repair itself.

Questions

1. What is a bomb calorimeter?

_____

_____

2. What does the thermometer show in a calorimeter?

_____

_____

3. About how many Calories per gram does fat give?

_____

_____

4. Why is the number from burning food not exactly what the body gets?

_____

_____

5. What did Wilbur Atwater study?

_____

_____

6. Why are the numbers on food labels only close guesses?

_____

_____

7. What does food give besides energy?

_____

_____

Words to know

calorie: a unit that measures energy
calorimeter: a device that measures heat by burning something
kilocalorie: a unit of energy equal to one thousand small calories
fiber: plant material in food that the body cannot digest

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Burning Food to Count Its Calories

Triangle group

A food label lists calories, but what exactly is being counted? A calorie is a unit of energy. Strictly speaking, the Calorie on a label is the larger unit, the kilocalorie, which equals a thousand small calories. One small calorie is about the energy needed to warm one gram of water by one degree Celsius.

To measure the energy in a food, scientists have long used a device called a bomb calorimeter. A small, dried sample of the food is sealed inside a strong steel chamber filled with oxygen and lit by an electric spark. The chamber sits in a known amount of water. As the food burns, it gives off heat, the water warms, and a thermometer records the rise. Because the amount of water is known, the temperature change reveals how much energy the food released.

This method measures the energy in a food, but the human body is not a furnace. Digestion does not extract every bit of energy, and fiber, for example, passes through mostly undigested. In the late 1800s, an American chemist named Wilbur Atwater studied how much usable energy people actually get from different nutrients. His work led to averages still used today: protein and carbohydrate supply about four Calories per gram, while fat supplies about nine. Labels rely on such averages, so the numbers are close estimates rather than exact measurements.

Calories are only part of nutrition. Two foods with the same count can differ greatly in vitamins, minerals, and fiber. Energy is the fuel, but food also supplies the materials that the body uses to grow and repair itself.

Questions

1. What is a bomb calorimeter?

_____

_____

2. What does the thermometer record in a calorimeter?

_____

_____

3. About how many Calories per gram does fat supply?

_____

_____

4. Why is the number from burning food not exactly what the body gets?

_____

_____

5. What did Wilbur Atwater study?

_____

_____

6. Why are the numbers on food labels only estimates?

_____

_____

7. What does food supply besides energy?

_____

_____

Words to know

calorie: a unit that measures energy
calorimeter: a device that measures heat by burning something
kilocalorie: a unit of energy equal to one thousand small calories
fiber: plant material in food that the body cannot digest
nutrients: substances in food that the body needs

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Burning Food to Count Its Calories

Square group

A food label lists calories, but what precisely is being counted? A calorie is a unit of energy, and strictly speaking, the Calorie printed on a label is the larger unit, the kilocalorie, which is equivalent to a thousand small calories. One small calorie is approximately the energy needed to warm a single gram of water by one degree Celsius.

To determine the energy contained in a food, scientists have long relied on an apparatus called a bomb calorimeter. A small, dried sample of the food is sealed inside a sturdy steel chamber filled with oxygen and ignited by an electric spark, while the chamber rests in a known quantity of water. As the food burns, it releases heat, the water warms, and a thermometer records the increase. Because the amount of water is known, the temperature change reveals how much energy the food released.

This method measures the energy stored in a food, but the human body is not a furnace. Digestion does not extract every last bit of energy, and fiber, for instance, passes through mostly undigested. In the late 1800s, an American chemist named Wilbur Atwater investigated how much usable energy people genuinely obtain from different nutrients. His work produced averages that are still in use today: protein and carbohydrate supply about four Calories per gram, whereas fat supplies about nine. Labels depend on such averages, so the figures they display are close estimates rather than exact measurements.

Calories represent only one part of nutrition. Two foods with an identical count can differ enormously in their vitamins, minerals, and fiber. Energy is the fuel, yet food also provides the raw materials that the body uses to grow and to repair itself.

Questions

1. What is a bomb calorimeter?

_____

_____

2. What does the thermometer record during the test?

_____

_____

3. Roughly how many Calories per gram does fat supply?

_____

_____

4. Why does the energy found by burning food differ from what the body obtains?

_____

_____

5. What did Wilbur Atwater investigate?

_____

_____

6. Why are the figures on food labels only close estimates?

_____

_____

7. What does food provide in addition to energy?

_____

_____

Words to know

calorie: a unit that measures energy
calorimeter: a device that measures heat by burning something
kilocalorie: a unit of energy equal to one thousand small calories
fiber: plant material in food that the body cannot digest
nutrients: substances in food that the body needs

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Burning Food to Count Its Calories

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Burning Food to Count Its Calories

Easier · 251 words · Flesch-Kincaid grade 5.6

1. A device that burns a bit of food to measure the heat it gives off.
2. How much the water warms up.
3. About nine.
4. Digestion does not get all the energy out, and fiber mostly passes through.
5. How much usable energy people really get from food.
6. Labels use averages instead of measuring each food exactly.
7. Vitamins, minerals, and what the body needs to grow and repair.

Triangle: Burning Food to Count Its Calories

This passage · 267 words · Flesch-Kincaid grade 9.6

1. A device that burns a food sample to measure the heat it gives off.
2. The rise in the temperature of the water.
3. About nine.
4. Digestion does not extract every bit of energy, and fiber passes through mostly undigested.
5. How much usable energy people get from different nutrients.
6. Labels rely on averages rather than measuring each food exactly.
7. Vitamins, minerals, and materials for growth and repair.

Square: Burning Food to Count Its Calories

Harder · 284 words · Flesch-Kincaid grade 11.9

1. An apparatus that burns a food sample to measure the heat it releases.
2. The increase in the temperature of the water.
3. About nine.
4. Digestion does not extract every bit of energy, and fiber passes through mostly undigested.
5. How much usable energy people obtain from different nutrients.
6. Labels depend on averages rather than exact measurements of each food.
7. Vitamins, minerals, and raw materials for growth and repair.