

PowerPlay

POST-VISIT

Food: What Is a Calorie?

9

All animals, including humans, are consumers, which means they obtain food by eating other organisms. Students learn that people derive their energy from the food that they eat; that this energy is measured in a unit, called a calorie; and that different foods provide different amounts of energy.

TIME

15 minutes
for setup; 45
minutes for
activity

M A T E R I A L S

TEACHER

- Single-hole punch
- Masking tape
- Pair of scissors

PER GROUP OF STUDENTS

- Prepared soft drink can (bottom half of a soda can with two holes punched out at the top, aligned directly across from one another; cover sharp edge with masking tape; see illustration above)
- Pencil (to be used as a holder for the can)
- Graduated cylinder or beaker (100-ml)
- 6-in thermometer (°C)
- 2 pieces of round, unsweetened oat cereal (Cheerios®)
- 1/2 pecan (no shell)
- Large paper clip
- 2-cm piece of clay
- Matches or lighter
- Safety goggles for each student
- Water
- Copy of student sheet
- Two different food labels
- Nonflammable, flat surface



amount of energy required to raise the temperature of one gram (or one ml of water) of pure water one degree Celsius. The calories shown on most food labels are written with an uppercase "C," which represents one kilocalorie or 1,000 calories.

The Children's Museum of Houston's PowerPlay exhibit is designed to help young people discover new ways to be physically active, and also to reinforce healthy behaviors. Students must be aware of the energy needed for the physical activities they do. They also must understand that different foods provide differing amounts of energy. Carbohydrates, fats and proteins are the main sources of energy in our food. Sugars, starches (such as those in bread, pasta and potatoes), and fiber (in many vegetables, whole fruits and whole grains) are the main forms of carbohydrates. Foods rich in fats include animal and vegetable oils, lard, butter and cream. Proteins, the building blocks of muscles and molecules within cells, are present in meats, eggs, and animal products, as well as in plant materials, like nuts and beans.

Each food group provides different amounts of energy. Fats and oils provide about nine Calories (Cal) per gram. Carbohydrates and proteins each provide four Cal per gram. Excess energy from food is stored in the body as fat.

ENGAGE

1. Ask students to discuss the basic needs of most living things. Make sure students understand that all living things need energy to live. Some organisms (mainly plants) use sunlight to make their own food, but many (including humans) rely on other living things for energy.
2. Have students pair off, and give each pair two different food labels. Instruct students to examine the nutritional information and read the calorie and

TEXAS ESSENTIAL KNOWLEDGE AND SKILLS (TEKS) OBJECTIVES

SCIENCE

2.9, 3.9, 4.9, 5.9

Organisms and environments. The student knows that plants and animals have basic needs and depend on the living and nonliving things around them for survival.

Living things that cannot harness solar energy through photosynthesis must eat other organisms, or the products of other organisms, as food. The amount of energy stored in food usually is measured in calories, with one calorie defined as the

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➔ nutritional information on each label. Ask, *Do all types of food provide the same amount of energy?*

EXPLORE

1. Challenge students to predict which provides more energy: a carbohydrate-rich food or an oil-rich food.
2. Have one student from each pair collect all materials for his/her team from a central area in the classroom.
3. Direct students follow the instructions on their activity sheets to complete the investigation. They will begin by pouring 50 mL of water into the prepared soft drink can and measuring the temperature of the water.
4. Next, students will create a food holder from the paper clip and clay (see illustration, right). They will hang two pieces of oat cereal on the paper clip and light them from below. They should hold the can by the pencil support, with the bottom of the can about one inch above the flame. If necessary, students should re-light the cereal pieces until they will no longer burn. When the flame has gone out, they should record the final water temperature.
5. Have students repeat the investigation using a piece of pecan that is approximately the same size as the two pieces of cereal together (place on top of the paperclip "holder").
6. Have students follow the instructions on the student page to calculate the approximate number of calories released by the similar volumes of each food.



EXPLAIN

1. Discuss results with the class. Ask, *Which food released more heat when burned? Which food had more calories?*
2. Help students understand that, due to the nature of the chemicals involved, fats and oils are more energy-rich than carbohydrates.
3. Fats are rich sources of energy. Certain fats and oils are

healthier than others. Fats that are solid at room temperature, such as shortening, margarine and lard, should be avoided. In general, these fats are called "saturated" fats. Healthier choices are olive, flaxseed, nut, and fatty fish or canola oils ("unsaturated" fats). "Trans" fats are created by adding hydrogen to vegetable oil (hydrogenation). They are used in many commercially produced foods because they are less likely to spoil and have a longer shelf life. Trans fats are less healthy than many other forms of fat.

4. Foods that can contain large amounts of unhealthy fats include some red meats, whole milk dairy products and cream, some salad dressings, chocolate, cakes, cookies and some crackers.

ELABORATE

1. The first version of this activity had students compare similar "portion sizes" of cereal and pecan. Have students conduct the investigation again, using similar masses of cereal and pecan.
2. Have students weigh the pieces in advance and adjust the amount of each "fuel" tested to ensure that similar masses of cereal and pecan are compared.

EVALUATE

1. Give each student team two new food labels and ask them to determine the calories provided by each food group described on the labels.
2. Have students record the amounts of saturated fat, trans fat and sugar found in a serving of the food listed on the label.

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The activities described herein are intended for school-age children under direct supervision of adults. The authors, Baylor College of Medicine, the Children's Museum of Houston and funders cannot be responsible for any accidents or injuries that may result from conduct of the activities, from not specifically following directions, or from ignoring cautions contained in the text.

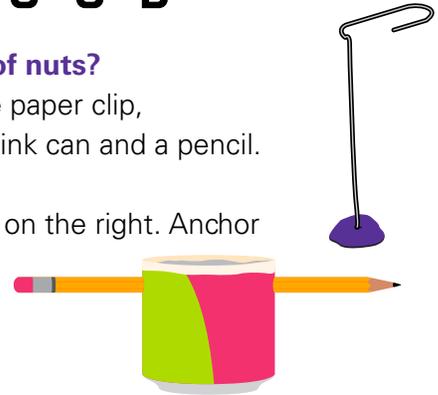


CALORIES IN FOOD

What has more calories, breakfast cereal or a similar-sized portion of nuts?

To find out, you will need a pecan half, two pieces of cereal, clay, a large paper clip, a thermometer, 100 mL of water, matches or a birthday candle, a soft drink can and a pencil.

1. Straighten the sections of a paper clip so that it looks like the image on the right. Anchor the base in the clay, with the curved part of the paper clip in the air.
2. You also will need a soft drink can with the top removed. Slide a pencil through the holes in the sides of the can to make a handle.



Cereal

3. Add 50 mL of water to the can. Measure the starting temperature of the water and record your result in the box to the right.
4. Hook the cereal pieces on the paper clip. Carefully light the cereal from below using a match or candle.
5. Hold the can of water by the pencil, about one inch above the top of the flame. If the cereal stops burning, light it again until it won't burn any more. Measure the temperature of the water again and record the result.
6. How many degrees did the temperature of the water change? Record your answer.

CEREAL	
Starting water temperature:	°C
Final water temperature:	°C
Change in temperature:	°C

Pecan

7. Repeat steps 3–6 using the pecan piece. Place the pecan on top of the paper clip. After the pecan is completely burned, record the water temperature in the box to the right.

PECAN	
Starting water temperature:	°C
Final water temperature:	°C
Change in temperature:	°C

How many calories?

A calorie is the amount of energy needed to raise the temperature of one mL of water by one degree Celsius. To find out how many calories were given off by each food, multiply the change in temperature in degrees by 50. Record your answers below.

Total calories: Cereal _____ Pecan _____

Teacher Tips

Follow these guidelines when your students visit the PowerPlay exhibit at the Children's Museum of Houston (CMH).

- Students must wear tennis shoes.
 - The CMH's PowerPlay exhibit is on three levels, connected by the Power Tower. Level 2 of the Power Tower is on the main entry level of the Museum. It is suggested that teachers have a chaperone on each level of the Power Tower or have a chaperone accompany each group.
 - An elevator for handicapped children is available (CMH guide will have key). It is suggested that you inform CMH officials about any special needs your students may have before you arrive at the museum.
 - Before your visit, help students understand the difference between heart rate while resting and after exertion, (see "Activity 3. Heart Rate and Exercise").
 - Also before your visit, explain to students that they will rate (on a 1–10 scale) the amount of effort they expend during some of the activities in the exhibit. This is known as "perceived exertion rate."
 - Ask the CMH guide for a "Kid Card" (Power Tracker) for each student. To set up a card, each student will need the information below before visiting the Museum (see "Kid Card" video). Please make sure your students are ready to enter the following information (or have a chaperone assist).
 - Username (numbers and letters only)
 - Password
 - Male or female
 - Birthday (numerical date)
 - E-mail (optional)
- As a final step, have students measure their baseline heart rates.

IDEAS FOR TEACHERS WITHOUT ACCESS TO THE CHILDREN'S MUSEUM OF HOUSTON

- Incorporate any of the lessons into your regular curriculum.
- Plan a special "field day" at your school. Prior to the event, conduct the Pre-visit lessons. After the event, use the Post-visit lessons.
- Create a classroom fitness plan that provides one month of activities. Help students plan a calendar with different fitness activities for each day.
- Participate in the President's Challenge for fitness (www.presidentschallenge.org).

Exhibit Key

	Cardiovascular	Strength	Flexibility	Balance
Power Tower: Climb, leap and jump in a 3-story climbing structure that takes you to other parts of PowerPlay.				
Dance Mania: Listen to music and follow along with different dance moves. Record your heart rate after you play.				
Match My Moves: Capture images of your own body in action and follow the poses you've set through a sequence of quick movements, testing your endurance and raising your heart rate.				
Light Chase: Race around an interactive game board, while increasing your speed and raising your heart rate.				
Jump It Up: Get your heart pumping as you jump over a glowing, virtual rope, which gets faster and faster the more you jump!				
Blast Off: Crank hand pedals as fast as you can to race flying superheroes across the exhibit.				
Adventure Course: Run through a course of climbing and crawling activities along padded, sloping surfaces! Slap each hand whacker along the way and record the level you achieve.				
Mt. Boulder: Face three challenges on a climbing wall and measure how far you've climbed, your grip strength, reach, flexibility and coordination.				
Grip It: Measure your grip strength and record this measurement using your Kid Card.				
Power Course: Grab a scoot and use your upper body strength to push or pull yourself along this wheelchair accessible course.				

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