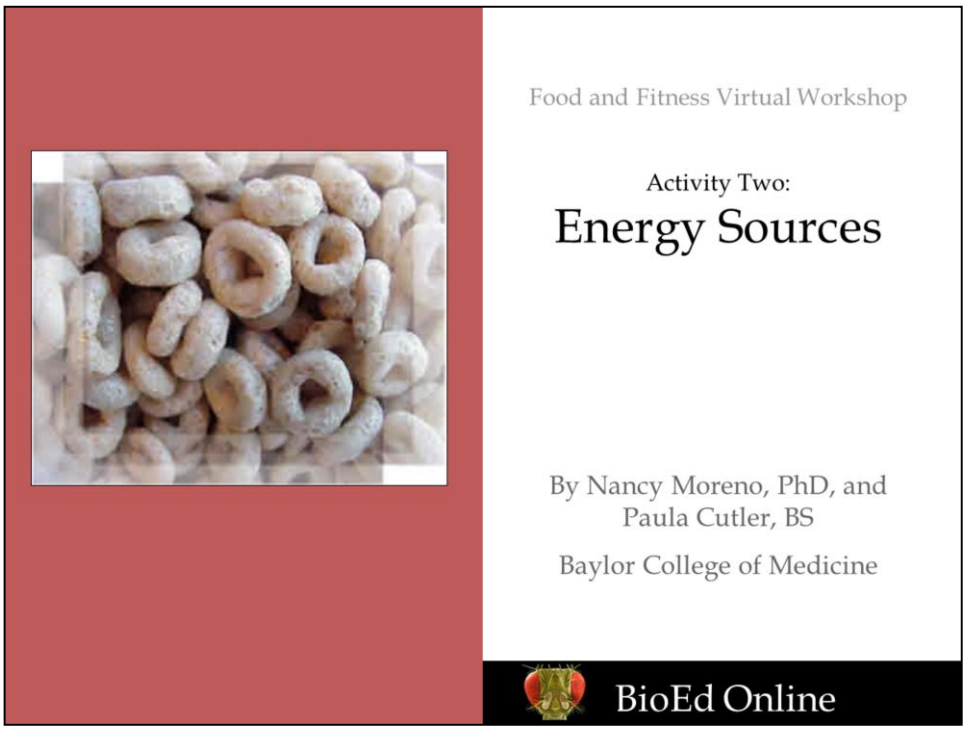


Virtual Workshop: Food and Fitness (Activity Two) - Energy Sources

Activity Two: Energy Sources, of the instructional unit, Food and Fitness, teaches students about energy stored in food and the measurement of energy in calories.

Science concepts covered in this activity include the following.

- Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion and the nature of chemicals.
- Food provides energy for living things.
- Different foods provide different amounts of energy.

The complete Food and Fitness Activities Guide for Teachers may be downloaded as a PDF file from the Teacher Resources menu on BioEd Online.
<http://www.bioedonline.org/resources/nsbri.cfm>

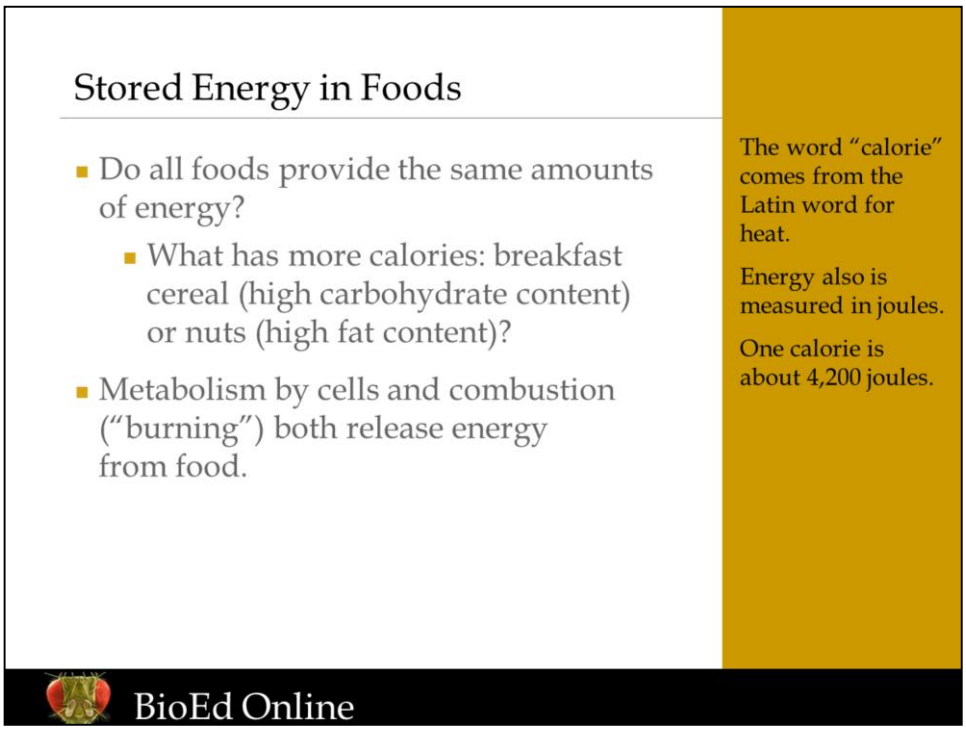
Viewing this presentation fulfills part of the requirements for completing the Virtual Workshop on Energy, Food and Nutrition ("Food and Fitness"), offered for professional development contact hours on BioEd Online.

Funding for development of the Food and Fitness unit and accompanying online professional development was provided by the National Space Biomedical Research Institute (NSBRI), a consortium of leading biomedical research centers funded by the National Aeronautics and Space Administration (NASA). Visit the following sites for more information about these

organizations.

Center for Educational Outreach, Baylor College of Medicine: <http://www.ccit.bcm.tmc.edu/ceo/>
National Space Biomedical Research Institute: <www.nsbri.org>
National Aeronautics and Space Administration: <http://www.nasa.gov>

Image Reference:
Hall, R. *Cereal.* About.com Nutrition Guide. Retrieved 6-30-2004 from http://nutrition.about.com



Stored Energy in Foods

The amount of energy stored in food usually is measured in calories. One calorie is defined as the amount of energy needed to raise the temperature of one gram of pure water (equivalent to one milliliter of water) one degree Celsius. The calories shown on most food labels actually are kilocalories (=1,000 calories). The word "Calorie," when written with an upper case "C," also denotes kilocalories.

When a carbon-containing molecule is burned (combustion), it consumes oxygen, produces carbon dioxide and water, and liberates energy (which can be felt as heat).

Since this activity involves an open flame, teachers may prefer to conduct it as a demonstration for the class. If students are performing the investigation in groups, the following safety guidelines from the Council of State Science Supervisors should be followed.

1. Demonstrate the procedure before allowing students to replicate the activity. Look for possible hazards in the classroom. Alert students to potential dangers.
2. Constant surveillance and supervision of student activities are essential.
3. Smoke, carbon monoxide, and heat detectors are recommended in every laboratory. Units should be placed in the laboratory and related areas (storerooms, preparation rooms, closets, and offices).
4. A positive student attitude toward safety is imperative. Students should not fear doing experiments, using reagents, or equipment, but should respect them for potential hazards. Students should read lab materials in advance, noting all cautions (written and oral).
5. Teachers must set good safety examples when conducting demonstrations and experiments. They should model good lab safety techniques, such as wearing aprons and goggles.
6. Rough play or mischief should not be permitted in science classrooms or labs.
7. Closed-toe shoes are required for labs involving liquids, or heated or heavy items that may injure the feet.
8. Confine long hair and loose clothing. Laboratory aprons should be worn.
9. Proper eye protection devices must be worn by all persons engaged in supervising or observing science activities involving potential hazards to the eye.
10. Give consideration to the National Science Teachers Association's recommendation to limit science classes to 24 students or less for safety.

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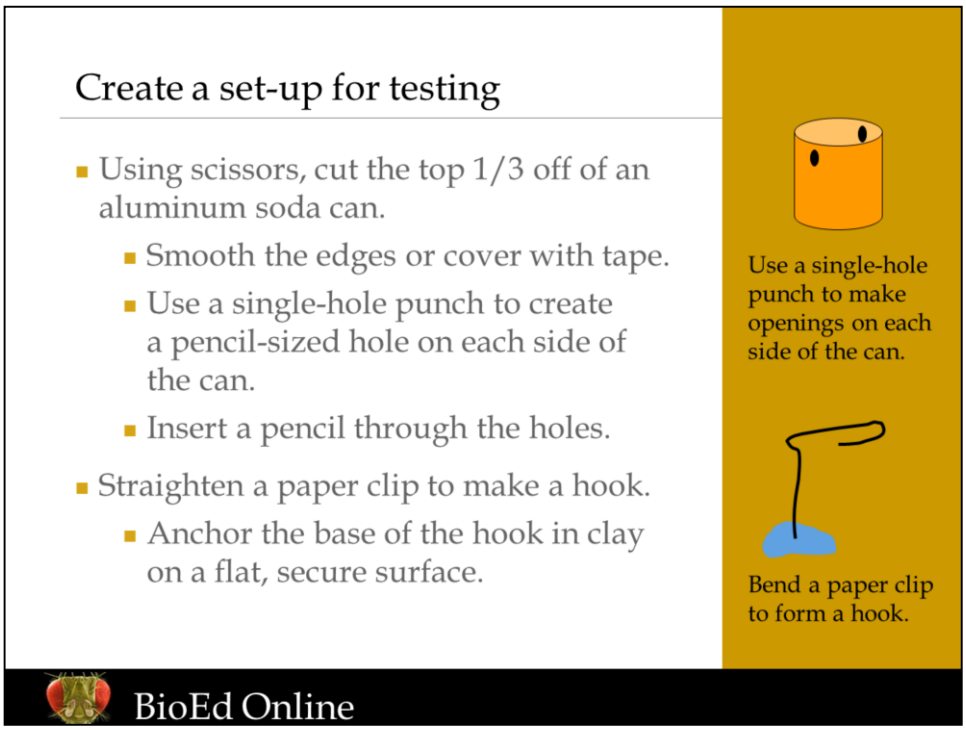
Reference

The Council of State Science Supervisors. *Science and safety making the connection*. Retrieved 6-30-2004 from http://csss.enc.org/safety.htm



Create a set-up for testing

Students can create their own testing set-ups, or the teacher may prefer to prepare everything in advance. To cut the top 1/3 off of a soda can, crease the side of the can slightly and snip the crease. Insert the tip of the scissors and cut around the can. To smooth the edge, cut around again or cover the cut edge with tape.

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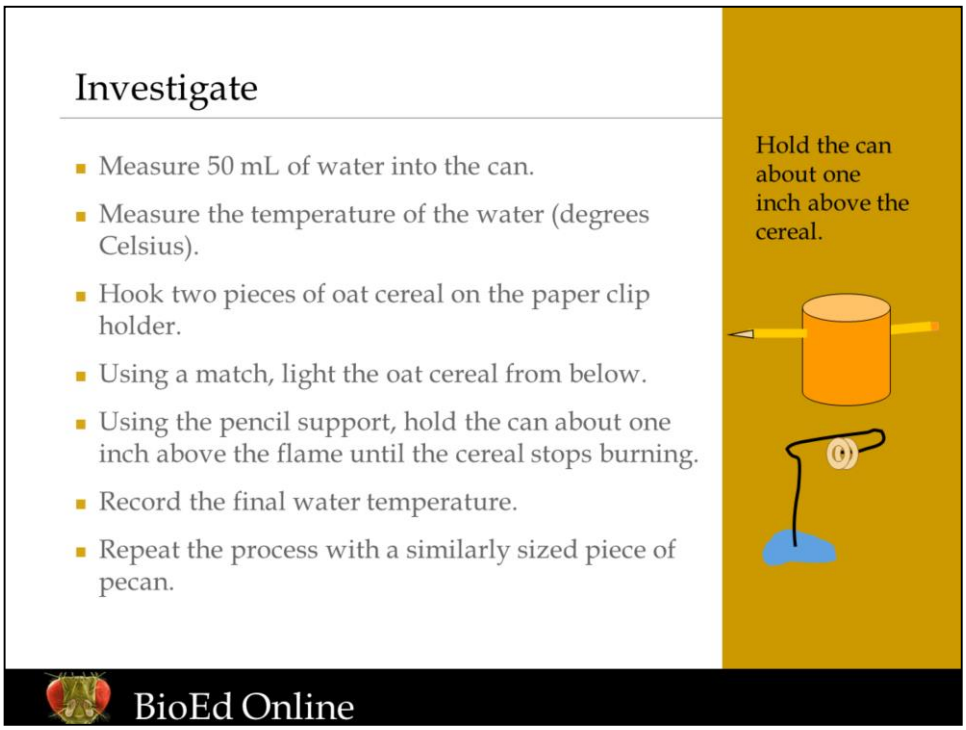

Investigate

Since this activity involves an open flame, teachers may prefer to conduct it as a demonstration for the class. Appropriate safety guidelines can be found at the Council of State Science Supervisors Science Education Safety website: http://csss.enc.org/safety.htm

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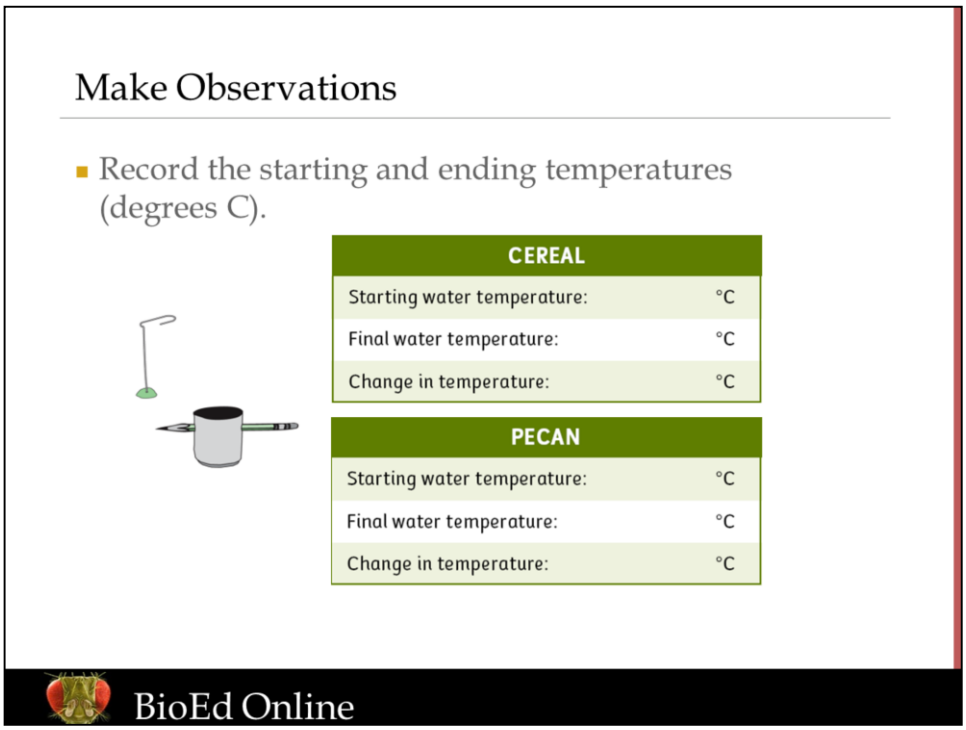

Make Observations

Students will notice that the pecan burns much longer and with a larger flame than the oat cereal. This difference is due to the high fat content of pecans (and nuts, in general). Fats are rich sources of energy and provide about nine Calories per gram. Carbohydrates and proteins each provide four Calories per gram. Certain fats and oils are healthier than others. In general, fats, such as shortening, margarine and lard, that are solid at room temperature should be avoided. Healthier choices include plant-based oils like olive, flaxseed, nut or canola oils.

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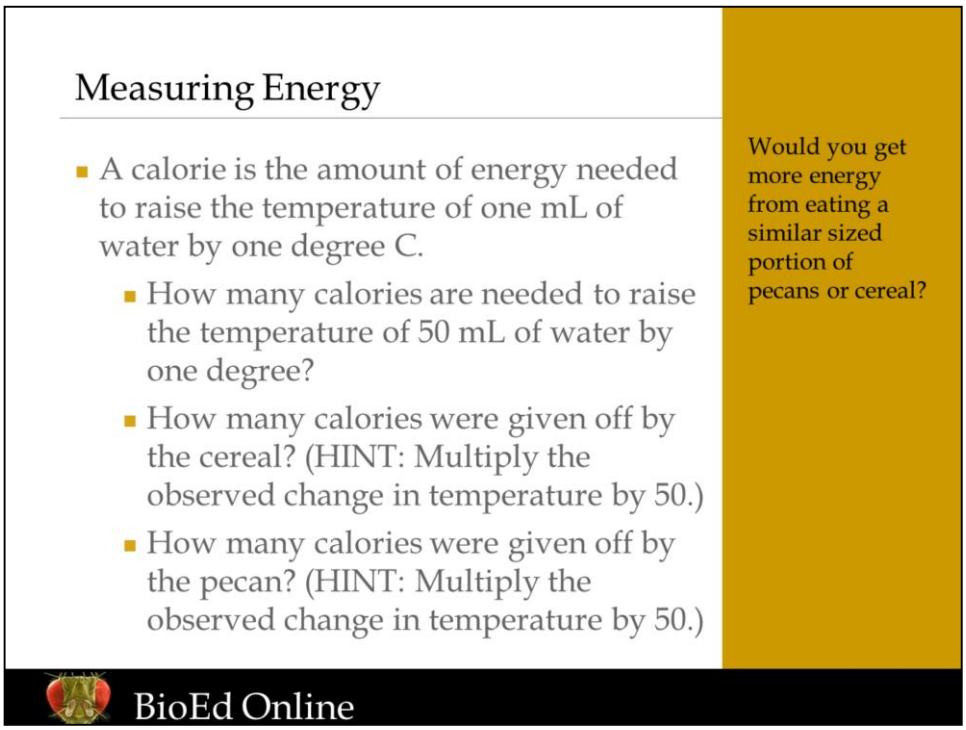
Image Reference

Moreno, N. P., Rahmati-Clayton, S., Cutler, P. H., Young, M. S., & Tharp, B. Z. (2006). *The science of food and fitness*. Houston, TX: Baylor College of Medicine.



Measuring Energy
One calorie is defined as the amount of energy needed to raise the temperature of one gram of pure water (equivalent to one milliliter of water) by one degree Celsius. Students can approximate the calories in each of the foods tested by multiplying the temperature change in each case by 50. This measure, of course, is just an estimate. Calorie content actually is measured in a calorimeter in which all conditions are carefully controlled.

Carbohydrates, fats and proteins are the main energy sources in foods. Sugars, starches (such as those in breads, pasta and potatoes) and fiber (as in bran and many vegetables) are the primary 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, as well as in plant materials, such as nuts and beans. In this activity, the oat cereal consists almost entirely of carbohydrates (sugar and oat flour). The pecan contains both proteins and oil. The oil content contributes to the higher calorie content of the nut on a per-gram basis. At the same time, nuts are a denser food than the baked cereal, which also contributes to their higher calorie content.

The calories reported on most food labels represent one kilocalorie, or 1,000 calories, and often are written with an uppercase “C.”

Carbohydrates and proteins supply four Calories (kilocalories) per gram. Fats and oils provide about nine Calories per gram.

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