



Watts On Your Mind?

Solar energy educational activities for schools

Activity Overview

Grade Level: 3-5

Activity: UE-5

General Description

Students will construct two models of solar cookers that will cook a hot dog or smores: a parabolic solar collector and a pizza box solar cooker. While they cook the hot dog, they will watch the collectors to see how it focuses sun on the food. The teacher will discuss each collector and what the energy they collect does (i.e. heat water, produce electricity).

Learning Outcome

Students will learn that solar collectors have different shapes. Different shaped collectors gather energy for different uses.

Subjects

Science, home economics

Process Skills

Hands-on manipulation, teamwork, verbal communication, following directions

Duration

1 hour

Key Vocabulary

Parabolic collector,

Curriculum Standards

Texas (TEKS):

112.6.a.2, 112.7.b.5.8,

112.6.b.4.11

Louisiana (LSCS):

PS-E-C6, PS-E-C7, PS-M-C2,

PS-M-C3

Arkansas (ASCF):

3.1.4

National (AAAS Project 2016):

Make Solar Cookers

Materials

Parabolic Cooker

- Clear plastic tennis ball can
- Wire clothes hanger
- Aluminum foil
- Oven thermometer

Pizza Box Cooker

- One pizza box
- Black construction paper
- Aluminum foil
- Scissors, or X-acto knife
- Heavy-weight clear plastic laminate (plastic wrap or oven bags)
- Double-sided tape
- Oven thermometer

Method 1 – Parabolic Solar Cooker

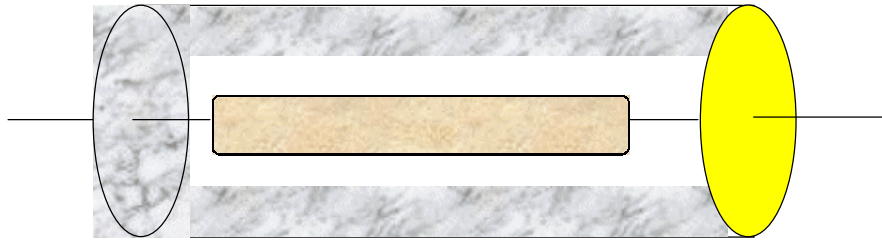
Setting Up the Experiment:

1. Poke a small hole in the center of the tennis ball can lid, and make another small hole in the center of the base of the can.
2. Place a small sheet of aluminum foil inside the can so it covers about 3/4 of the inside of the can and leaves a long window about 2 inches wide along the length of the can. Tape the foil in place with double-sided tape.
3. Straighten out the coat hanger, put one end through the hole in the bottom of the can.
4. Put the hot dog or marshmallow on the coat hanger.
5. Pull the coat hanger through the hole in the lid of the can and replace the lid. (You might need to tape the lid down.)
6. Refer to the illustration.



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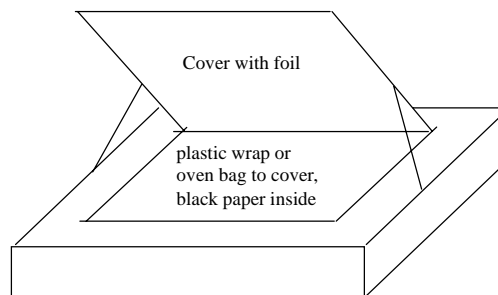
Parabolic Solar Cooker

Doing the Experiment:

1. Place the solar cooker so the mirrored trough faces the sun.
2. Adjust the trough up and down until the mirrored surface focuses sun on the hot dog.
3. Cook the hot dog or marshmallow.
4. Record temperature and compare with pizza box solar cooker

Method 2 – Pizza Box Solar Oven

1. Line the bottom of the pizza box with black construction paper and tape it down.
2. On the top cover of the pizza box draw a square 1" from all the sides.
3. Cut along three of the lines but leave the fourth line near the box's hinge uncut. Carefully fold open the flap.
4. Wrap a piece of aluminum foil around the flap, smooth wrinkles, and secure the foil to the flap with double-sided tape.
5. Tightly stretch or lay your plastic or oven bag over the hole on the inside of the top of the box. Smooth the plastic and secure it around the sides with tape so no air can escape
6. Use tape to prop open the flap and allow aluminum lining to reflect the maximum amount of sunlight into the oven.



Pizza Box Solar Cooker



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Background Information

Parabolic Solar Cooker. A parabolic collector is made up of a trough and a tube running down the center of the trough. The trough is a long, rectangular mirror formed in a U-shape. The mirror is tilted toward the sun to focus sunlight on the tube. The shape focuses the sunlight on the tube. The tube carries the fluid to be heated. A tracking device keeps the mirrors pointed toward the sun as it moves across the sky. Parabolic collectors are used mostly to provide hot water for use in industry and sometimes in homes. They are also used to produce electricity.

Pizza Box Solar Cooker. This solar oven is adapted from a design created in 1976 by Barbara Kerr. The construction enables the user to cook anything that can be prepared on a conventional oven or stovetop and eliminates the need for stirring or basting. For a manageable project in the classroom you might try s'mores (graham crackers with melted marshmallows and chocolate) or English muffin pizzas.

The oven can reach temperatures of 275 degrees, hot enough to cook food and kill germs in water. A general rule for cooking in a solar oven is to get the food in early and don't worry about overcooking. Solar cookers can be used six months of the year in northern climates and year-round in tropical locations. Expect cooking time to take about twice as long as conventional methods and allow about half an hour to preheat.

Assessments

Students observe differences in the cooker design and how it can affect the temperature and cooking time of the hotdog. Students will also observe how positioning the cooker so it receives different amounts of sunlight can affect the temperature and cooking time.

Questions

1. How long did it take to cook the hot dog?
2. Did you have to move the cooker to keep the sun focused on the hot dog?