

Build a Pizza Box Solar Oven

Age Range: 8+

Skills/Subjects:

- Science
- Alternative Energy
- Engineering
- Art Design
- Recycling
- Cooking

Introduction:

Have you ever eaten food that was cooked outside, such as for a BBQ or while camping? Did you know that you can directly use solar power to cook food? This can be done using a solar oven, which is a low-cost, ecologically friendly technology. In this activity you will build your very own simple solar oven out of a pizza box to gather the sun's rays and—cook a tasty treat for you!



Solar ovens use solar energy—light and heat emitted from the sun—to cook food. They can also be used to pasteurize water or even sterilize instruments. How does a solar oven work? The simple answer is that it is designed to absorb more heat than it releases.

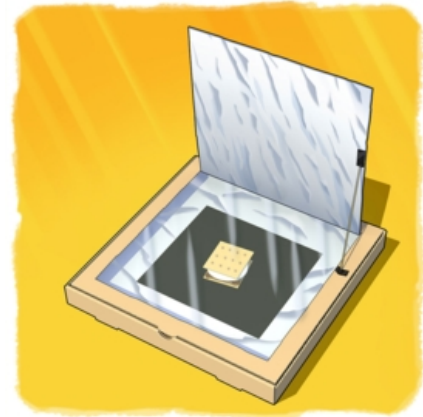
Materials:

- Pizza box (The larger the box, the better the oven should work.)
- Pencil or pen
- Ruler
- Utility knife or scissors
- Aluminum foil
- White school glue
- Plastic wrap
- Shipping tape or black electrical tape
- Sheets of black paper
- A wooden skewer (or you can use the pencil)
- Warm, sunny day
- Graham crackers, marshmallows and a chocolate bar (Optional, if you want to cook some s'mores in your solar oven.)

Directions

1. If needed, clean out the pizza box so it is ready to become a solar oven. Remove any liners that the box came with.
2. On the top of the pizza box's lid, draw a square that is about one inch inward from each edge.
3. Get an adult's help to use a utility knife (and the ruler as a straightedge) to carefully cut along each side of the square you just drew except for the side that runs along the hinge of the box. Cut all the way through the cardboard on those three sides of the square. Then fold the flap back slightly along the attached side.

4. Line the inside of the cardboard flap with aluminum foil. Fold the edges of the foil over the flap to help hold the foil in place and glue the foil onto the flap. Keep the foil as smooth as possible. *What do you think the purpose of this foil is?*
5. Cover the opening made by the flap (in the lid) with a layer of plastic wrap. Attach the plastic wrap to the opening's edges using shipping tape or black electrical tape. Make sure there are no holes in the plastic wrap and that all of its edges are completely attached to the lid. *Why do you think it's important to make sure the plastic wrap completely seals the lid's opening?*
6. Line the inside of the box with aluminum foil so that when you shut the box the entire interior is coated with foil. It is easiest to do this by covering the bottom of the box with foil and then covering the inside part of the lid (going around the plastic-covered opening) with foil, too. Glue the foil in place. *Why do you think you should coat the inside of the box with foil like this?*
7. Glue or tape a sheet of black paper to the bottom of the box, centered there. This will act as your solar oven's heat sink. *How do you think it will help cook your food?*
8. Lastly, use a wooden skewer or pencil (and some tape) to prop the solar oven's lid up, at about a 90-degree angle from the rest of the box.
9. Leave the solar oven outside on a hot day (outside temperatures—above 85 degrees Fahrenheit is recommended, and the hotter the better. It should also not be windy.). *Does the oven get very warm?*
10. **Extra:** If you want to cook a s'more, break a graham cracker in half and place a marshmallow and small piece of chocolate between the cracker halves. Place the prepared s'more on a small square of aluminum foil that is slightly larger than the s'more (this will serve as a tray) and put it in your solar oven on top of the black sheet of paper. Put the solar oven outside where it will get full, direct sunlight for at least 30 minutes and keep it turned so that the flap faces the sun. When the marshmallow is soft your s'more should be ready to eat and enjoy!



Observations and Results

In this activity you built a simple box-type solar oven that should have been able to cook a s'more in sunny, warm conditions. In some trials using a solar oven that was made based on this design, at 85 to 90 degrees F on a sunny afternoon it took about 30 to 35 minutes for the marshmallow to get warm enough to become soft and melt some of the chocolate to make a tasty, solar-powered treat! In ideal conditions this solar oven can easily heat up to about 160 to 200 degrees F. Using full, direct sunlight is important for heating this solar oven—the sunlight needs to be reflected into the oven (primarily from the aluminum foil-covered flap, but also from the inside of the box), and the heat must be trapped and retained inside by the plastic "window." This heat is also absorbed by the black paper to heat the food that is placed on top of it.