

STUDENT DATA SHEET

Reading passage:

Highlights

- *Solar cookers can be used every day or for solar picnics*
- *They come in many types*
- *They are easy to build, or can be bought-ready*
- *Solar cooking works well, is easy, fun and good for the environment*

Summary

Most of you know how it can be hot enough to fry an egg on the pavement. But have you ever seriously considered cooking with the sun? In some parts of the world, solar cooking is very popular.

Solar Cooker Basics

Just as there are many kinds of conventional cookers (ovens, stovetops, broilers, microwave ovens), there are many kinds of solar cookers. The simplest type of solar cooker is the "Cookit" shown in Figure 1. It consists of a single piece of cardboard with aluminum that is folded into a panel that acts like a reflector. A dark pot placed in a plastic bad can be the cooking container. The dark color allows more heat energy to be absorbed by the cooking container.

Solar cookers work because sunlight carries lots of power. For example, when sunlight hits a surface with an area of 1 square meter, there is about 1,000 watts of energy from the sun on that surface. Compare this to your toaster oven, which uses about 1,000 watts. In solar cookers, sunlight is concentrated into a cooking area that gets hot enough to cook food. If more sunlight can be captured, more power can be generated. Solar cookers sometimes have an insulated cooking chamber to prevent heat from escaping. However, we will not be working with these.

Solar Cooker Designs

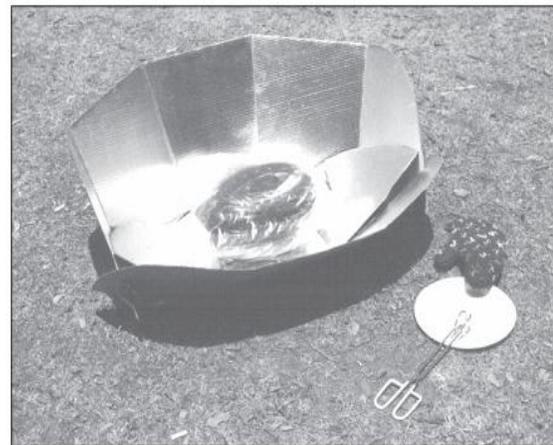


FIGURE 1. PANEL COOKER The "Cookit" panel cooker is simple but effective.

Figure 2 shows a solar box cooker. A solar box cooker consists of an insulated box, black on the inside (to absorb sunlight) with

a transparent cover (usually glass), and one or more reflective panels that allow more sunlight to enter the cooking chamber. Food is placed inside the changer in a dark-colored pot. Box cookers can reach temperatures in the mid to high 200 degrees F.

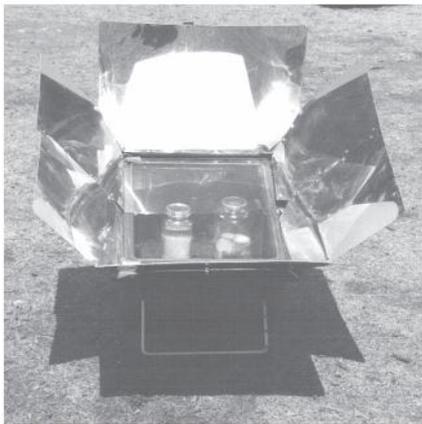


FIGURE 2. BOX COOKER Box cookers are excellent for slow cooking.

Solar cookers that use parabolic designs, as shown in Figure 3, have a dish reflector with a parabolic shape. The dish reflects sunlight into the focal region of the parabolic curve. A dark colored pot is usually placed at this focal region to get the most sunlight. Depending on the size of the reflector, very high temperatures can be reached. Parabolic solar cookers may have a large area to collect sunlight and therefore can generate high power; but

Cooking With A Solar Cooker

they typically do not have an insulated cooking chamber. Therefore, these solar cookers are used similarly to a conventional stovetop.

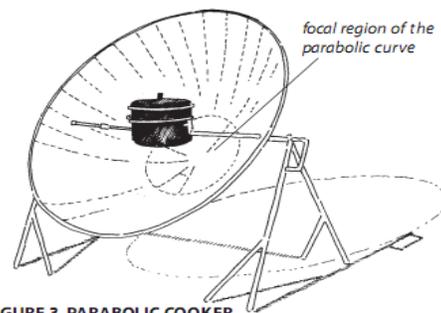


FIGURE 3. PARABOLIC COOKER
Parabolic solar cookers reflect sunlight into a fixed point.

Some solar cookers use both a parabolic cooker, which can focus direct sunlight in a particular area resulting in high heat, and an insulated cooking chamber. These cookers are called solar concentrator ovens. These ovens operate like a conventional oven because they can reach high temperatures. Figure 4 shows one such unit that is sold commercially.

As you can see from these examples, there are many different types of solar cookers that can be made. There are even cookers that are built into a couth wall, cookers that can fold into backpacks, cookers that are like stovetops and many more.

Just as we cook differently with stovetops, ovens and microwaves, different types of

solar cookers are used differently. A parabolic solar cooker might be used like a stovetop by heating a pan or pot to a high temperature. A box cooker is most effective when it is used like a crock-pot (slow cooking or low heat over a long time). And a solar concentrator oven can be used like a conventional oven.

Let's consider the simple box cooker. On a sunny day in San Diego, June-September, it will read temperatures around 250 degree, which will cook or bake most foods. The slow cooking brings out the flavor in many foods. Expect to cook food in this type of solar cooker about twice as long as with a conventional oven. But since it is almost impossible to burn foods in this type of

cooker, it does not matter how long food is left to cook. People who use solar box cookers usually prepare their dish, put it in the cooker, and go away until it is ready to eat. They can also move the oven a couple of times as the sun moves across the sky to better capture sunlight.

In general, solar cookers work best on bright, sunny days and when the sun is high. But they can still cook food even if the sky is hazy or partly cloudy.

Where you live and the weather can affect how well a solar cooker cooks food. The type of conditions that could affect it are: how high above sea level (higher altitudes should be better), latitude, seasonal rainfall and air pollution

INTRODUCTION STUDENT WORKSHEET

1. In your own words, describe the basic idea of how a solar cooker works:
2. If you wanted to bake a pot of beans that needed to be cooked at a low heat for a long time, what is the best type of solar cooker to use? Why?
3. What kinds of food or dishes would you bake in each of the solar cookers described in the reading passage? Explain why you think the cooker would cook your selected dish well.
 - a. Box Cooker:

b. Parabolic Cooker:

c. Concentrator Cooker:

Vocabulary

Absorb:

Altitude:

Conventional:

Insulated:

Latitude:

Parabolic:

Reflector:

Transparent:

Lab Report Form: Constructing and Testing Solar Cookers

Date:

Purpose of this lab:

Instructions: Record your measurements in the Data Table below. Once you have completed the measurements and calculations, answer the question at the end of this form.

DATA TABLE. Temperature Readings of Water Place in Solar Cookers

Time (mins)	Cooker #1	Cooker #2	Cooker #3	Cooker #4
0:00 (initial)				
0:02				
0:04				
0:06				
0:08				
0:10				
0:12				
0:14				
Total Temperature Change:				

Data Summary

1. Which solar cooker achieved the highest water temperature? Why?
2. In which solar cooker did the water temperature start to change the fastest? Why?
3. Did one cooker maintain a constant temperature for a long time? Which one and why?
4. What did you learn about solar cookers after completing this activity?

Assessment Questions

1. In what circumstances would you use a solar cooker?
2. What local conditions might affect how well a solar cooker works?

Multiple Choice Questions:

1. Solar cookers
 - a. Are easy to build
 - b. Can be used on picnics
 - c. Are used in some parts of the world daily
 - d. All of the above
2. Types of cookers include:
 - a. Box cookers
 - b. Cone cookers
 - c. Parabolic cookers
 - d. All of the above
3. Solar cookers require:
 - a. Reflective material
 - b. Dark glass covers
 - c. Firewood
 - d. Constant monitoring
4. Foods you would like to try in a solar cooker include:
 - a. Cake
 - b. Rice
 - c. Spaghetti sauce
 - d. All of the above
5. One of the precautions to take with solar cooking is:
 - a. Shade the cooker
 - b. Wear sunglasses
 - c. Never cook vegetables
 - d. Not to burn food
6. Solar box cooker temperatures tend to reach:
 - a. 50F
 - b. 50C
 - c. 200-250F

- d. 72F
7. Solar energy:
- a. Is non polluting
 - b. Is free
 - c. Conserves other forms of energy
 - d. All of the above