

IGNITION SERIES

SOLAR COOKING SCIENCE



Instructions

Warning! — This set contains chemicals that may be harmful if misused. Read cautions on individual containers carefully. Not to be used by children except under adult supervision.

Only for use by children 8 years of age and older. Use only under careful supervision of adults who have familiarized themselves with the kit's written safety precautions.

Caution! — Read the instructions before use, follow them, and keep them on hand for reference.

Individual parts may have sharp points, corners, or edges. Do not injure yourself! Keep small children and animals away from the experiments. Store the kit out of the reach of small children. Keep the packaging and instructions as they contain important safety information.

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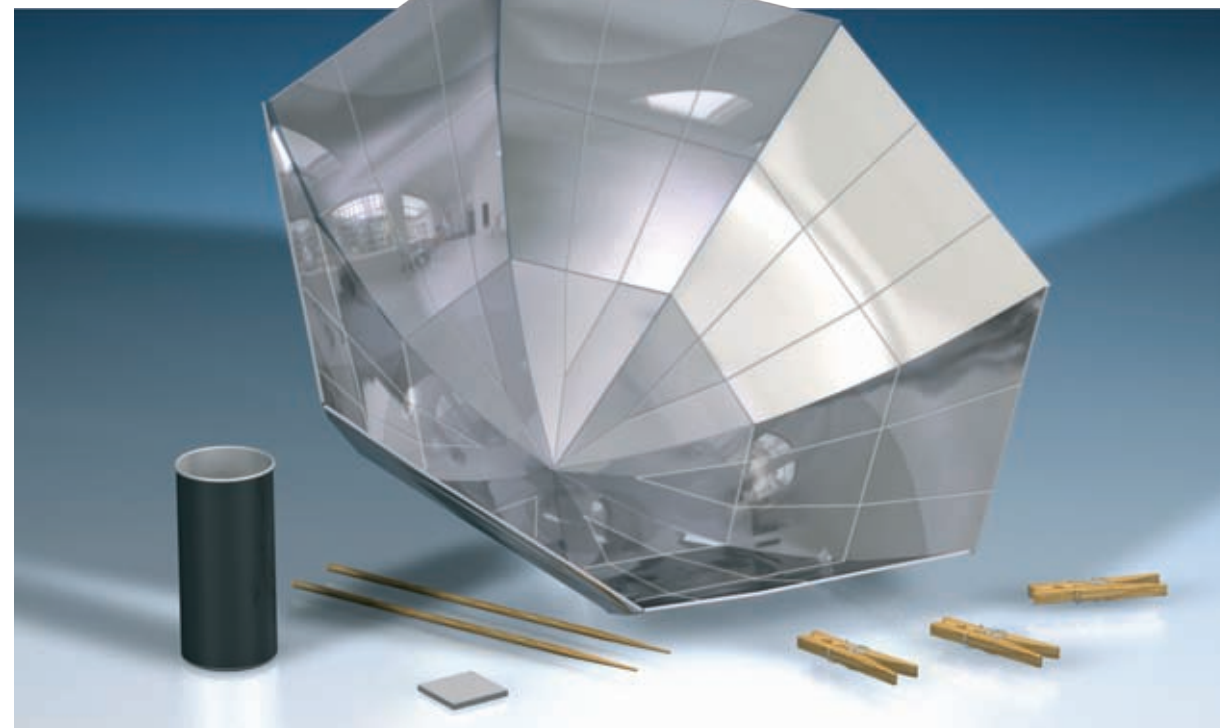
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Advice for Parents and Adults

With this science kit, your child can experiment with simple materials to assemble a solar cooker that demonstrates how the energy of the sun can be used for heating and cooking. In the world today, solar energy is becoming an increasingly important energy source. Solar power plants are expected to provide us with environmentally friendly, zero emission energy in the near future. In large solar thermal power plants, solar heated air spins turbines to generate electric power. With this solar cooker, children can see firsthand how solar energy works in a simple, easy to comprehend device.

Safety Information

It is common to have questions about the safety of a science kit. The experimental equipment in this kit meets US and European Safety Standards. These standards impose obligations on the manufacturer, such as forbidding the use of any particularly dangerous chemicals. The standards also stipulate that adults should assist their children with advice and assistance in their experiments. Tell your child specifically that he or she must follow all the instruc-



tions when experimenting. Before the experiment, please discuss the warnings and safety rules with your child.

Proper assembly and use of the solar cooker must be overseen by an adult. We hope you and your child have a lot of fun while experimenting with the solar cooker!

WARNING! HOT SURFACES!

The cooking pot gets very hot during operation. You must use the wooden clip, gloves, or oven mitts when moving or filling the cooking pot.

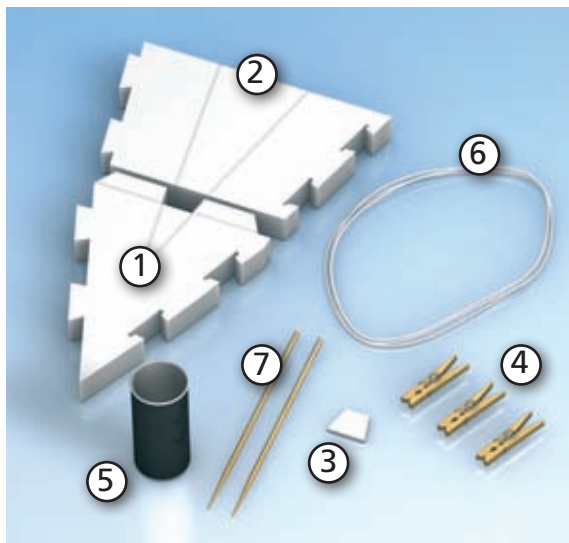
Caution! Sharp Points — The enclosed wooden skewers have sharp tips. Misuse may cause personal injury.

Caution! — Do not stare directly at the sun or at the concentrated sunlight reflecting off of the solar cooker.

Caution! — Do not leave the solar cooker unattended. There is a risk of fire when exposed to sunlight. This is particularly true in the vicinity of woods or dry grassy fields! Disassemble the cooker after each use.

Before experimenting, gather all the necessary parts. In addition to the parts in the kit, you will need all-purpose glue or a glue stick.

Contents



- | | |
|--------------------------------|------------------------|
| 1. 7 Triangular silver pieces | 6. 1 Rubber band |
| 2. 7 Trapezoidal silver pieces | 7. 2 Wooden skewers |
| 3. 1 Small cardboard part | 8. 1 Instruction sheet |
| 4. 3 Wooden clips | |
| 5. 1 Cooking pot | |

Solar Cooking Science Theory

Before we start to assemble and use the solar cooker (also called solar collector), we will first explore the scientific concepts behind the operation of the solar cooker.

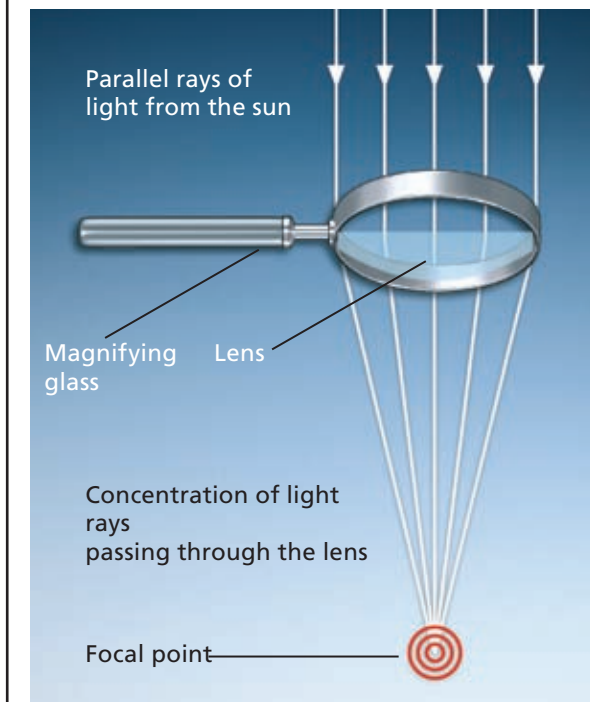
Catching Solar Energy

The sun is an incredibly powerful energy source. In the sun, hydrogen atoms are combined together into helium atoms. This process, known as nuclear fusion, releases vast amounts of energy which are radiated outward from the sun into space in the form of electromagnetic energy, some of which we can see as visible light and feel as heat.

Because of the distance between the sun and Earth, the light rays that reach Earth are all almost parallel to one another. To take full advantage of these parallel light rays, you have to know how to catch them.

Concentration of Light Rays

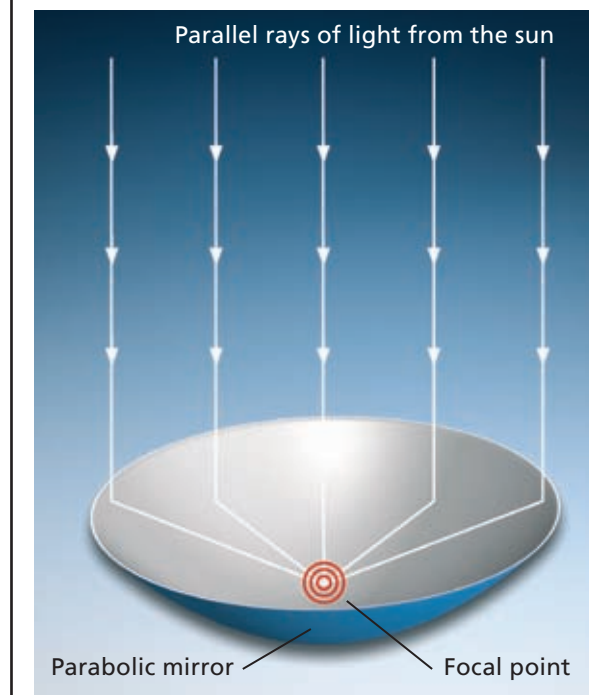
With a Magnifying Glass



The Magnifying Glass

One way to concentrate the sun's light and heat radiation is to use a **magnifying glass**. With this method, the rays passing through the lens are bent toward a single point, called the **focal point**. The illustration above shows how the parallel light is focused by the lens of the magnifying glass to converge at the focal point. The light and heat energy is concentrated at the focal point. Through this concentration of energy, very high temperatures can occur at the focal point. It can also get very bright at the focal point.

With a Parabolic Mirror



The Parabolic Mirror

The direction of the sun's rays can also be altered with a curved mirror, so that the rays converge at one focal point. The whole surface of the mirror reflects the parallel light rays toward this single point. As with the magnifying glass, it can get very hot and very bright at the focal point. But in this case, the focal point is right at the center of the mirror instead of some distance below the magnifying glass. Such a mirror is called a **parabolic mirror** because its curved reflector is in the shape of a parabola.

Conversely, if there was a light source (e.g. a light bulb) at this focal point, its rays would be bent and reflected outward in parallel. That is how the reflectors for a flashlight and car headlights work.

These parabolic mirrors are called **solar collectors**, and can be used as solar cookers. We will now assemble the parts in this kit into a parabolic solar cooker.