

Solar Energy Quick Facilitation Guide

Ages

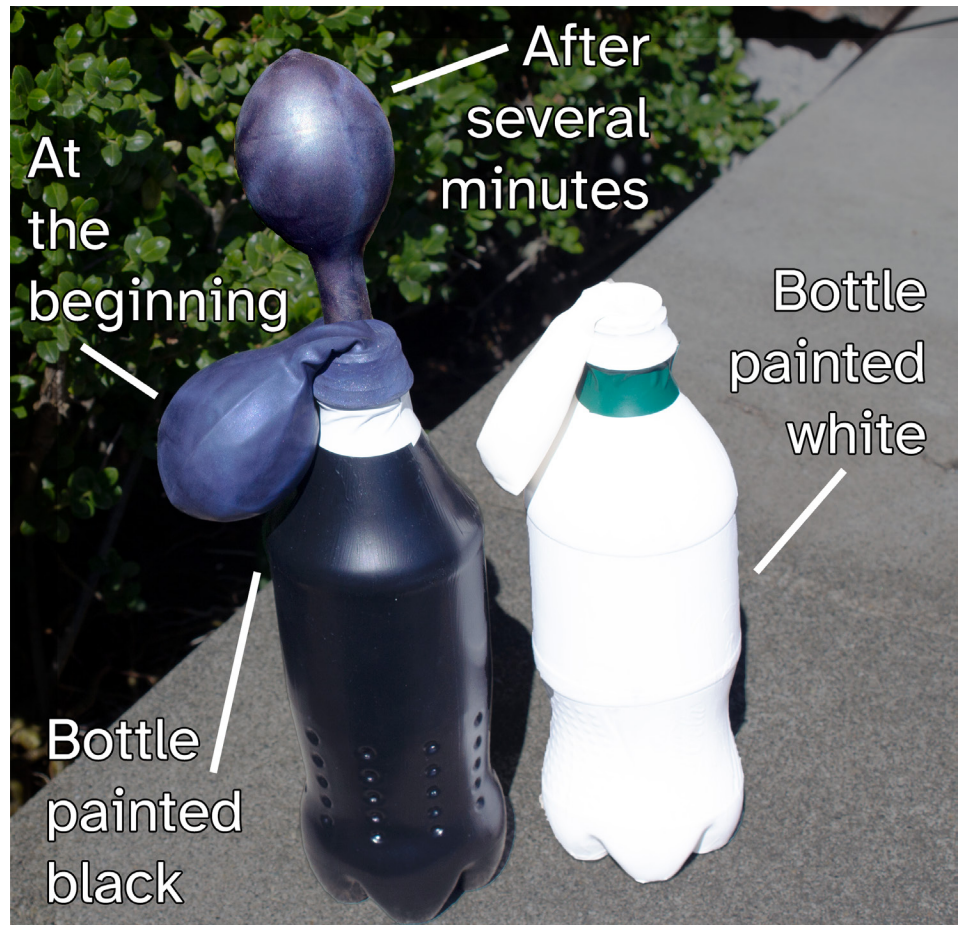
- ★ 12 and up

Activity Time

- ★ 20 minutes

Materials

- ★ 2 empty plastic bottles of the same size
- ★ 2 balloons of the same size
- ★ Paint brush
- ★ Black and white paints
- ★ Flexible tape like duct tape or electrical tape (*optional*)



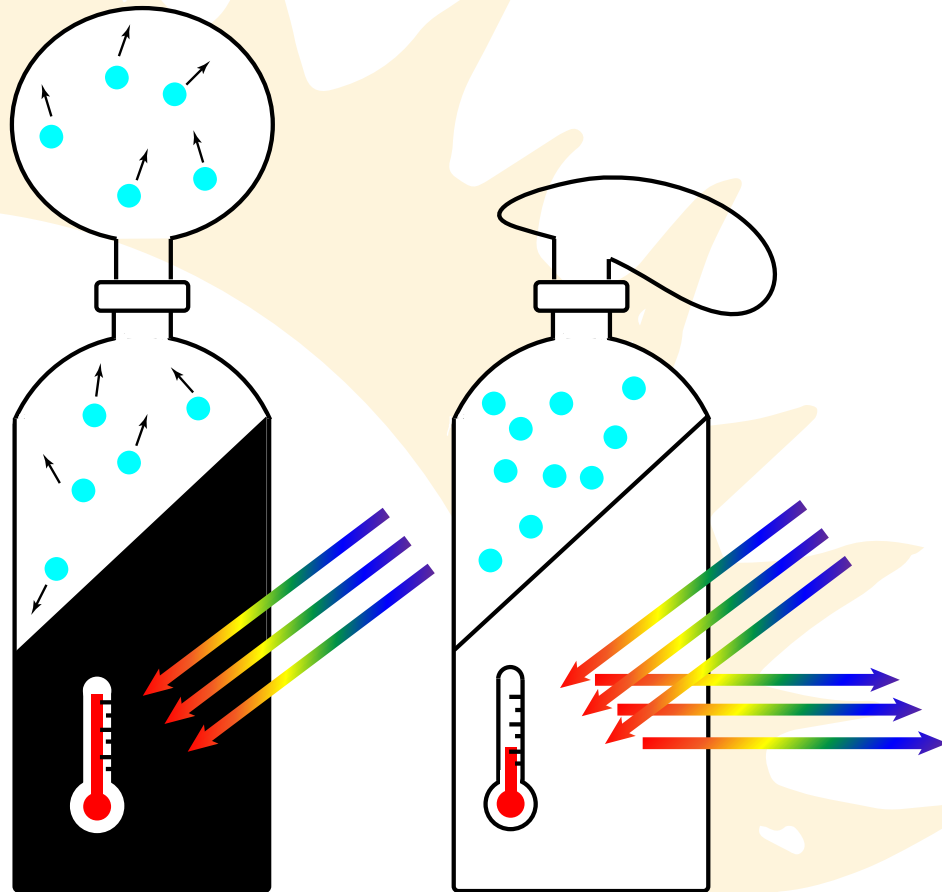
Instructions

This experiment demonstrates how different colored objects passively absorb sunlight at different rates. It's easy to set up!

- 1.** Paint one of your plastic bottles black and the other white. Make sure to cover as much of your bottle as possible. You may want to use multiple coats of paint.
- 2.** Place a balloon over the mouth of each of your bottles. Make sure the balloons are fully deflated and form an airtight seal around the mouth of your bottle. You may wish to secure the seal using some duct tape or electrical tape.

Once you've assembled your plastic bottles, place them in direct sunlight. After several minutes, you should see the balloon on the darker bottle start to expand. Why do you think that is?

How Does It Work?



This experiment works by taking advantage of how different colors absorb or reflect different wavelengths of light. Pigments like the ones in the paint you used to cover your plastic bottles work by absorbing certain wavelengths and reflecting others. For example, if you are wearing a blue shirt the blue pigment in your shirt's fabric is absorbing every wavelength but blue, reflecting blue back to the eye as you look at it.

Examine the diagram above. Black pigments absorb almost all the wavelengths of visible light while white pigments reflect nearly all of them. When the black plastic bottle absorbs light, some of the energy contained in the sunlight is converted to heat energy. This raises the temperature inside the bottle and causes the air in the bottle to expand, filling the balloon. The white bottle, reflecting most of the light energy, maintains its temperature and the volume of the air inside remains constant.

The ability of white objects to reflect light (*and therefore heat*) can be incredibly powerful. Sunlight reflected from glaciers and snow helped maintain cool temperatures during Earth's Ice Ages. Some architects and city planners have also started painting building roofs white to cool buildings without air conditioning and help combat climate change!