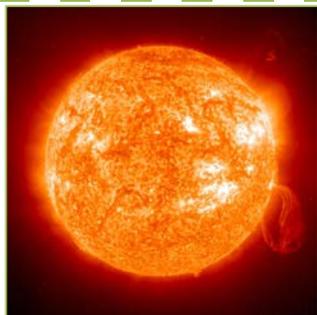


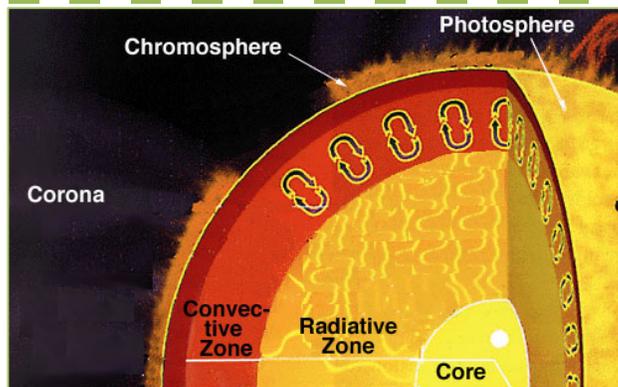
Name: _____

Hot Stuff! (Teacher Version)



Our Stellar Sun!

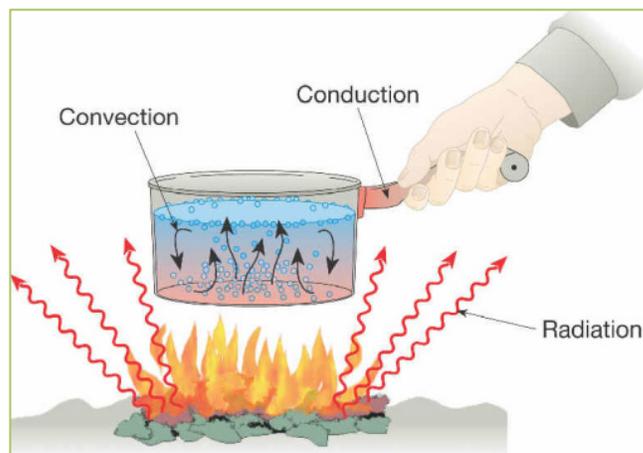
We know that the sun provides light and heat, and we will explore how we can make energy from the sun do work for us.



Did you know that there are 6 layers to the sun? It only takes 8 minutes for the sun's rays to reach us once it has left the chromosphere (outer surface), but it can take several hundred thousand years to get through the radiative zone. Why do you think this is?

The centre of the sun is so dense that the sun's light particles have a hard time getting out before bumping into another particle and being absorbed.

Energy transfer also happens in everyday situations as well! Label the following diagram with the 3 types of energy transfer (radiative, convection, and conduction).



Let's Make a Solar Cooker!

Materials:

- Aluminum Foil
- Stick/Long fork
- Marshmallows
- Empty Mixing Bowl



Caution: Never look directly into the sun or any glaring or bright spot on the solar cooker. Concentrated spots of sunlight can burn skin, so be careful with the concentrated sunlight gathered by the cooker.

Instructions:

1. Line the mixing bowl with aluminum foil, making sure the shiny side is facing upwards.

2. Put your solar cooker in a bright, sunny spot. Try to place it so that sunlight shines directly on the foil.

3. Find the hot spot in your cooker by holding your hand above it and bringing it down slowly until you find it.

4. Put a marshmallow on your stick and hold it so that the marshmallow is in the hotspot.

Name: _____

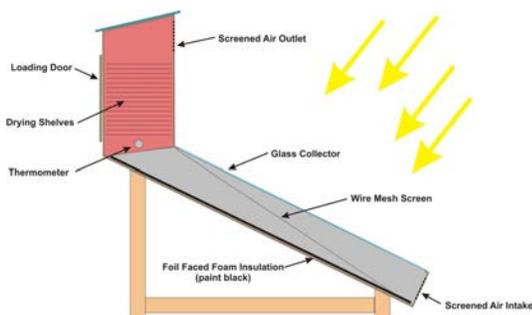
Follow-Up Questions:

1. How does the cooker work? *The sun is focussed into one point because of the curvature of the bowl, called a "hotspot".*
2. Why is the hotspot in that place? *The sun reflects off at the same angle as it came in at (angle of incidence). Since the mixing bowl is somewhat spherical, this symmetry allows the suns rays to converge near the centre.*
3. What happens when we leave things in direct sunlight? (Piece of bread, plant without water, child without sunscreen). *The sun changes the chemistry of things it comes in contact with, since its rays are so energetic. This can dehydrate or burn different objects.*



Dehydration Station

Dehydrating foods goes back at least 500 years. Native American's were known to make jerky out of venison and other meats, and ancient Egyptians would dry their grain to preserve it as well. Nowadays, dehydration is still a great option because it prevents bacteria from destroying food. Using a two-part solar collector and a drying cabinet, we can evaporate the water out of fruits and meats.



Based on your understanding of change of state and solar energy, try to write an explanation of how this sort of dehydrator works: *Solar rays are absorbed by the dark paint, warming the incoming air which rises to dehydrate the food in the drying trays as it escapes out the top.*

Solar Energy

We've seen how solar energy can be used to generate heat. However, solar energy can actually be used to provide electricity.

Solar Energy can be changed to electricity in 2 ways:

Photovoltaic/Solar Cells: Panels that change sunlight directly into electricity



Solar thermal/electric Power Plants: Use solar energy to make steam and power a generator.



Can you think of two benefits of solar energy? *They don't produce air pollutants or CO₂, and have a minimal impact on the environment.*

Can you think of two disadvantages of solar energy? *The amount of sunlight coming to Earth changes during the year, and is never constant during the day, so a lot of panels are needed. Panels are also expensive to dispose of when they stop working, and often are harmful to the environment.*

Name:

Image Sources:

Our Stellar Sun:

1. Smart Planet: <http://www.smartplanet.com/blog/thinking-tech/if-we-could-hear-the-sun-what-would-it-sound-like/>
2. Buffone Science: [http://buffonescience7.wikispaces.com/3\)++Our+Star+\(Sun\)+-+Ch+4.2](http://buffonescience7.wikispaces.com/3)++Our+Star+(Sun)+-+Ch+4.2)
3. Mr. Oey's Science Classes: <http://oeydms.weebly.com/conduction-convection--radiation.html>

Let's Make A Solar Cooker:

1. This Old House: <http://www.thisoldhouse.com/toh/photos/0,,20225533,00.html>
2. Joyus: <https://www.joyus.com/home/catalog/1-53423/rolla-roaster-telescoping-campfire-fork-blue?vp=1465>
3. Candy USA: <http://www.candyusa.com/FunStuff/CandyType.cfm?ItemNumber=932>
4. Maine Maple Kitchen: <http://www.mainemaplekitchen.com/pyrex2quartmixingbowl-pi-8160.html>

Follow-Up Questions:

1. Inspiration Green: <http://www.inspirationgreen.com/solar-cookers.html>

Dehydration Station:

1. Off-The-Grid News: <http://www.offthegridnews.com/2014/02/03/how-to-build-a-simple-solar-food-dehydrator/>
2. Mother Earth News: <http://www.motherearthnews.com/diy/build-a-solar-food-dehydrator.aspx>

Solar Energy:

1. REPLAN it: <http://replanit.tv/2013/04/09/solar-power-becoming-more-viable-around-the-world/>
2. Green Dairy: <http://www.greendiary.com/ten-simple-steps-build-solar-plant.html>