

STEAM Subject: Engineering
Lab: Solar Lamp

Grades: 4th-8th

Learning objective: Students will explore the real applications of solar energy. Students will harness the energy of the sun by creating solar lamps.

ENGAGE:

Ask students the following questions:

- What is solar energy?
 - Usable energy generated from the sun for electrical or thermal application.
- What is a solar cell?
 - A device that converts the energy of light into electrical energy through the photovoltaic effect.

Basic Components of a Solar Lamp

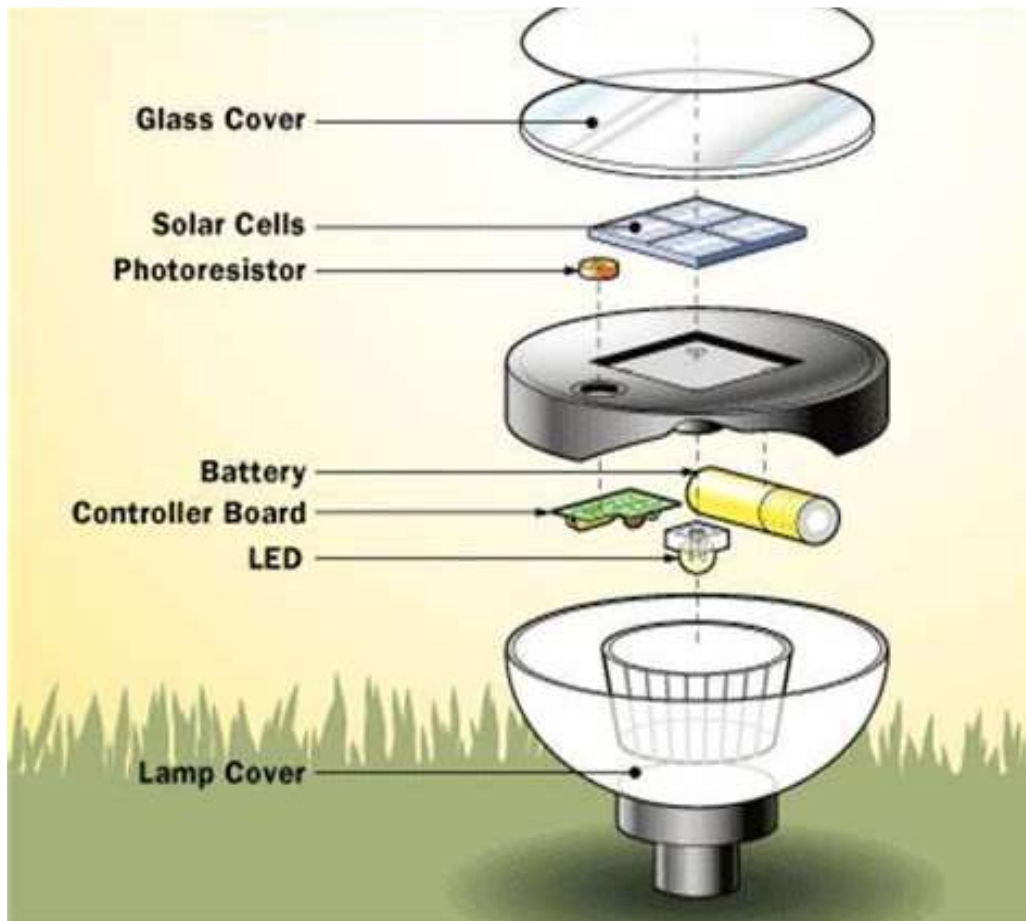


Fig.1 Source: <https://science.howstuffworks.com>

Example

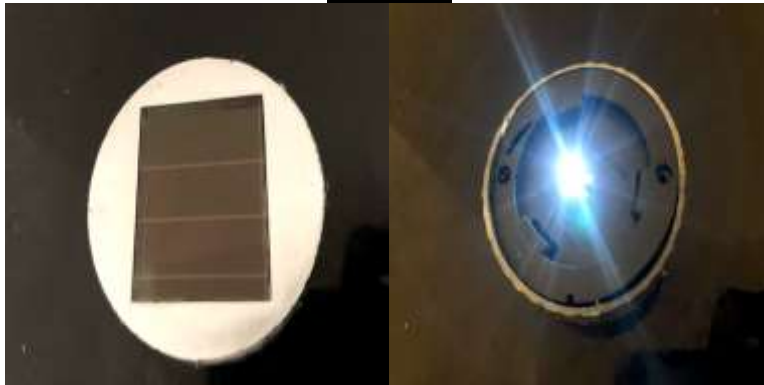


Fig.2
Solar cell example

Fig.3
LED underneath
solar cell

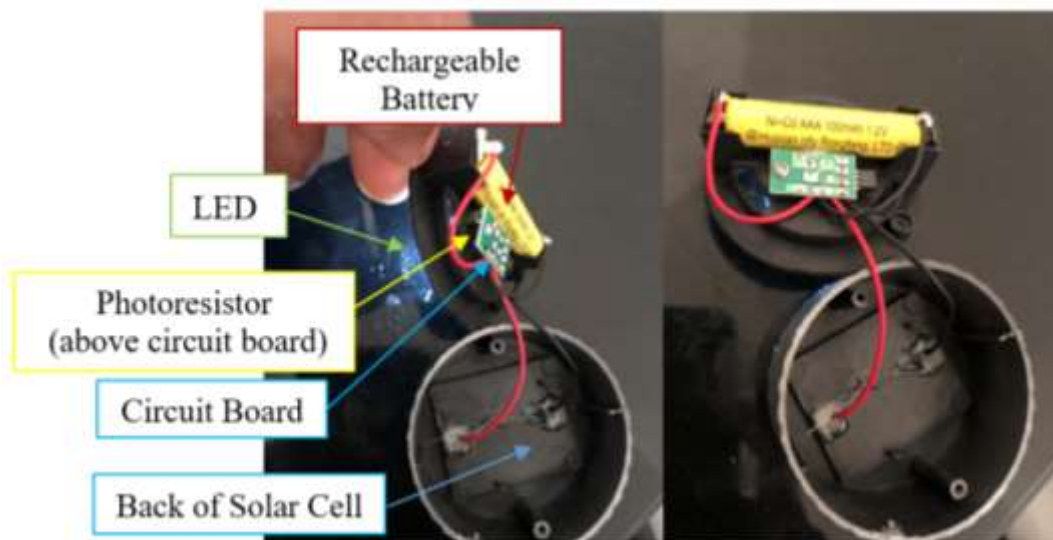


Fig.4 Inside an example solar cell device

EXPLORE:

Science Question: *How can we convert sunlight into electricity with a solar lamp?*

Activity: Solar Lamp

Students will create their own homemade solar lamp(s).

Materials needed per student:

- Solar cell device (no more than 2.25 inches in diameter). Example: Solar garden lights-found at Dollar stores or most local hardware stores.
- Mason jar-can be found at Dollar store or local commercial retailer
- Glue
- Any assortment of materials chosen by student to place into the lamp to shine in a dark setting or at night!
- A screwdriver may be needed (not required) if student would like to see components inside a solar lamp. Example of components inside a simple solar lamp are provided in Fig.4.

Directions: Build your own solar lamp

1. Set out materials (Solar cell device, mason jar and glue)



2. Remove lid of mason jar and set aside. Note: In this example a solar garden light device is used. If another solar cell device is used skip to step 4. *Make sure the solar cell is no larger than 2.25 inches in diameter.*
3. Take solar cell device and remove the bottom piece from top panel (no tools required)



4. Remove cover from the underside of mason jar lid and apply glue to the inner ring of mason jar lid



5. Insert solar cell panel into the inner ring of mason jar lid, wait for glue to fully dry



6. Twist top back on to the jar to make sure components are fitted properly.



7. Optional step! Each student can place into the jar something they would like to “illuminate” such as a dream, a hope, aspiration, outdoor/indoor object, etc. Below is an example of a plant placed inside the solar lamp with a soil layer.



EXPLAIN:

Have students observe how the light emitting diode (LED) is triggered on and off. Students can observe by placing their hands over and then away from solar cell on top of lamp. Students can also place the lamp in an environment with light and then in an environment without light.

Review Engineering Vocabulary:

- **Circuit Board:** connects various components via circuits to a central location for accomplishing a task.
- **Light Emitting Diode (LED):** device that emits visible light when an electric current pass through it.
- **Photoresistor:** “light-sensitive” device that allows or doesn’t allow electric current to pass through depending on the absence or presence of light.
- **Photovoltaic:** process of converting light (“photo”) into electricity (“voltaic”)
- **Rechargeable Battery:** electrical battery which can be charged, discharged and recharged multiple times, as opposed to a disposable battery.
- **Solar Cell:** device that converts the energy of light into electrical energy through the photovoltaic effect.
- **Solar Battery:** devices used to store energy generated from solar cells for later use.

Extension/Elaborate

Questions:

- What are the benefits of solar energy?
 - <https://www.sdge.com/residential/savings-center/renewables>
 - <https://archive.epa.gov/climatechange/kids/solutions/technologies/solar.html>
- What is the primary source of power for today's NASA missions?
 - Visit <https://www.nasa.gov/centers/ames/greenspace/clean-energy.html> to learn more!

EVALUATE:

Ask students to

- Mention other uses of solar energy.
- How can we best use solar energy? Give some examples.
- Make observations in their neighborhood about the use of solar energy.
- Students can write a discussion about the uses of energy in our everyday lives.
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