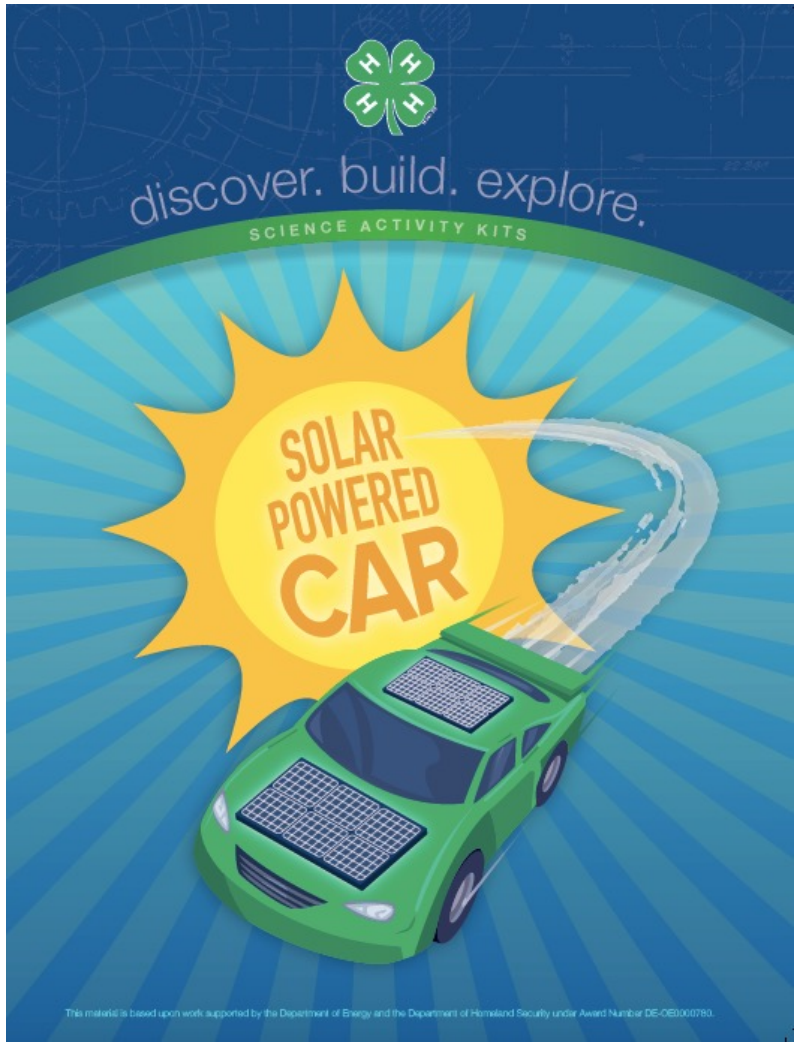
Solar Powered Car Activity Kit



The Challenge:
Design and Build a Solar Powered Car
that travels in a straight line when outdoors in sunlight.

Jana Sebestik, University of Illinois, Assistant Director STEM Curriculum Design, Office for Mathematics, Science, and Technology Education

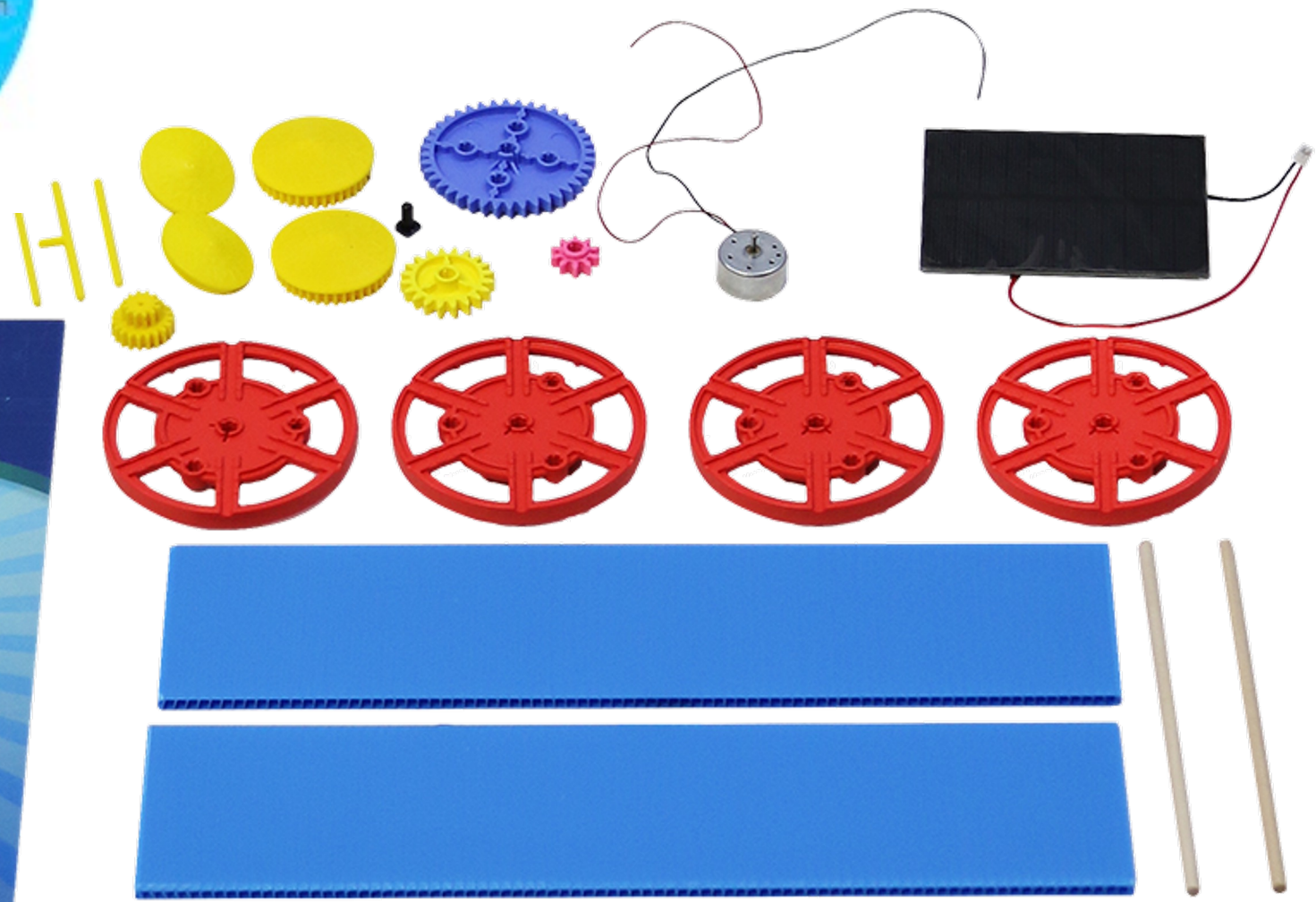
These resources have been created as a part of the education and outreach initiative associated with the Cyber Resilient Energy Delivery Consortium (CREDC) project and is based upon work supported by the Department of Energy and the Department of Homeland Security under Award Number DE-OE0000780.

materials provided by you

- Tape or glue
- Straws
- Scissors
- Beads or other spacers

materials included in the kit

- Solar panel
- Motor
- Vehicle base
- Wheels
- Axles
- Gears
- Motor adapter pin (for using larger gears)



Design and Build a Solar Powered Car

Your car will use a solar panel to power a motor. The motor will turn gears that make a wheel spin. Your basic design will include a base that holds the solar panel and motor, wheels and axles, and at least two gears.

Use your engineering skills to create and perfect a design of your own

- Design a body. Think about size and shape
- Position the wheels and axles
- Choose two gears, a smaller gear for the motor shaft and a larger gear for the wheel

U.S. Army photo by Bob Knoll

Design a Base for the Car

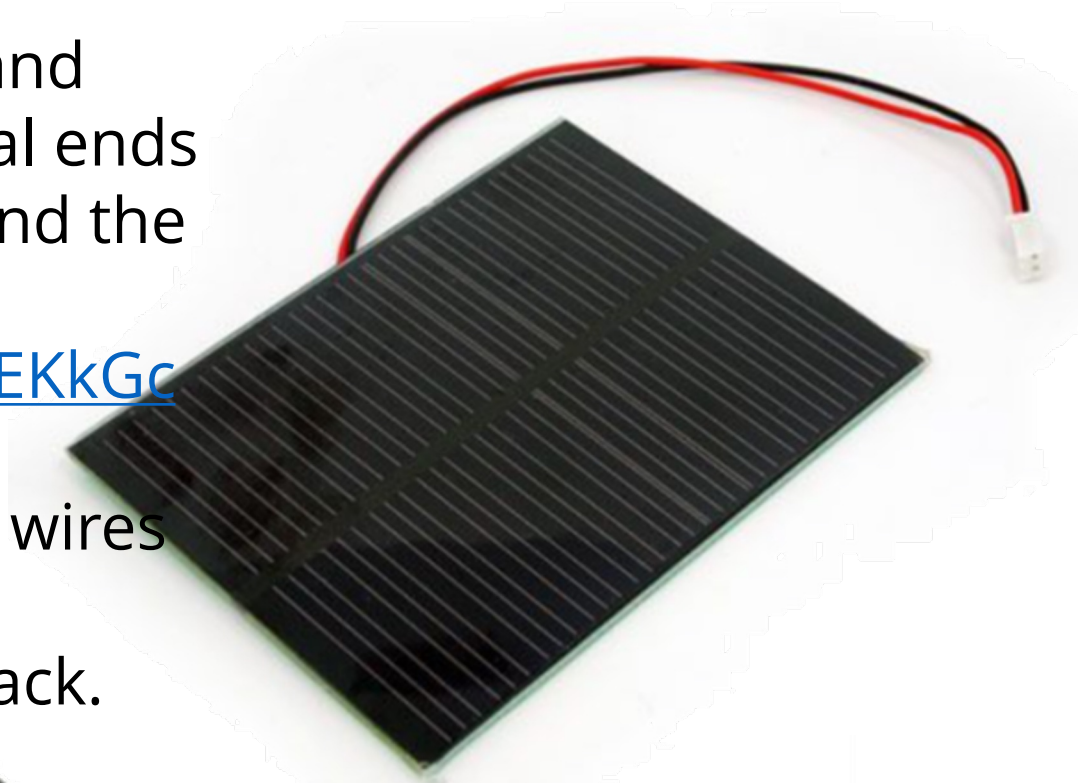
Think about size and shape and where you want to put the solar panel and the wheels.
Use scissors to cut the base.

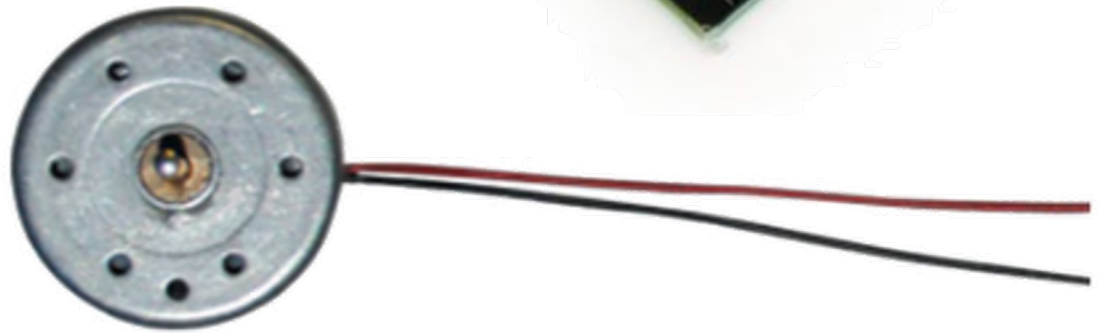
Preparing the Solar Panel and Checking the Motor

You may need to use scissors to cut the white connector off the leads from the solar panel and strip away a little of the insulation so the metal ends of the wires are exposed on both the motor and the solar panel .
https://www.youtube.com/watch?v=wZtWWHEKkGc

Connect the wires from the solar panel to the wires from the motor. Connect red to red and black to black.

Do you see the motor shaft spin when **sunlight** shines on the solar panel? Shining a cell phone flashlight on the solar panel can produce enough electricity to power the motor too.





Example Solar Powered Car

This example car uses large wheels and dowels for axles. The dowels are pushed through tunnels in the corrugated body, or through straws glued to the car body that make sleeves for the axles.
A small gear is attached to the motor shaft and a large gear is attached to the axle.
This car travels when light shines on the solar panel, but **you can make a better design.**

Add Wheels to the Car

For the front wheels push a wooden dowel axle through the center hole in one of the wheels and through a tunnel in the corrugated plastic body. Cut the dowel to size and attach another wheel.

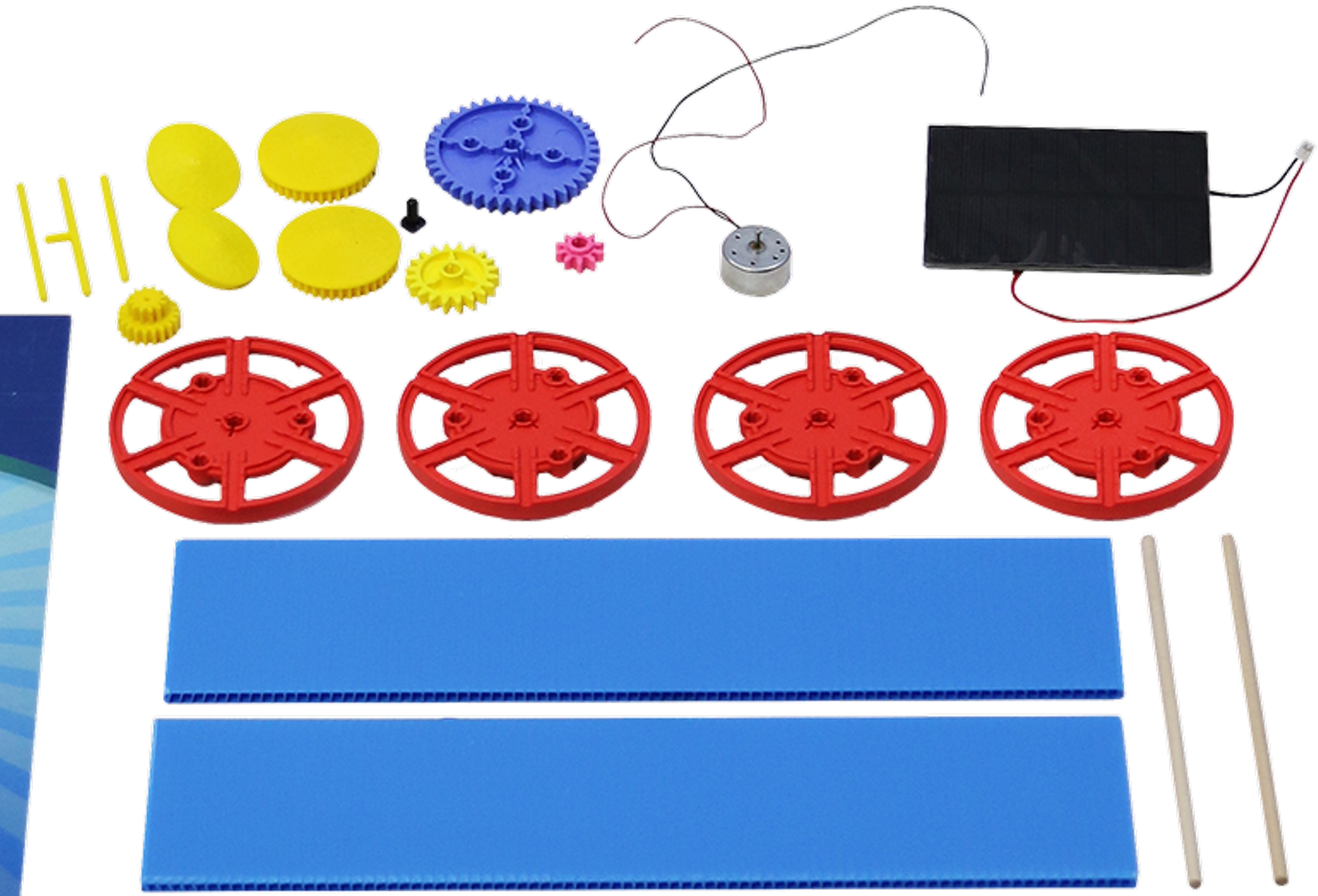
For the back wheels add a large gear to the axle between the car body and one of the wheels.

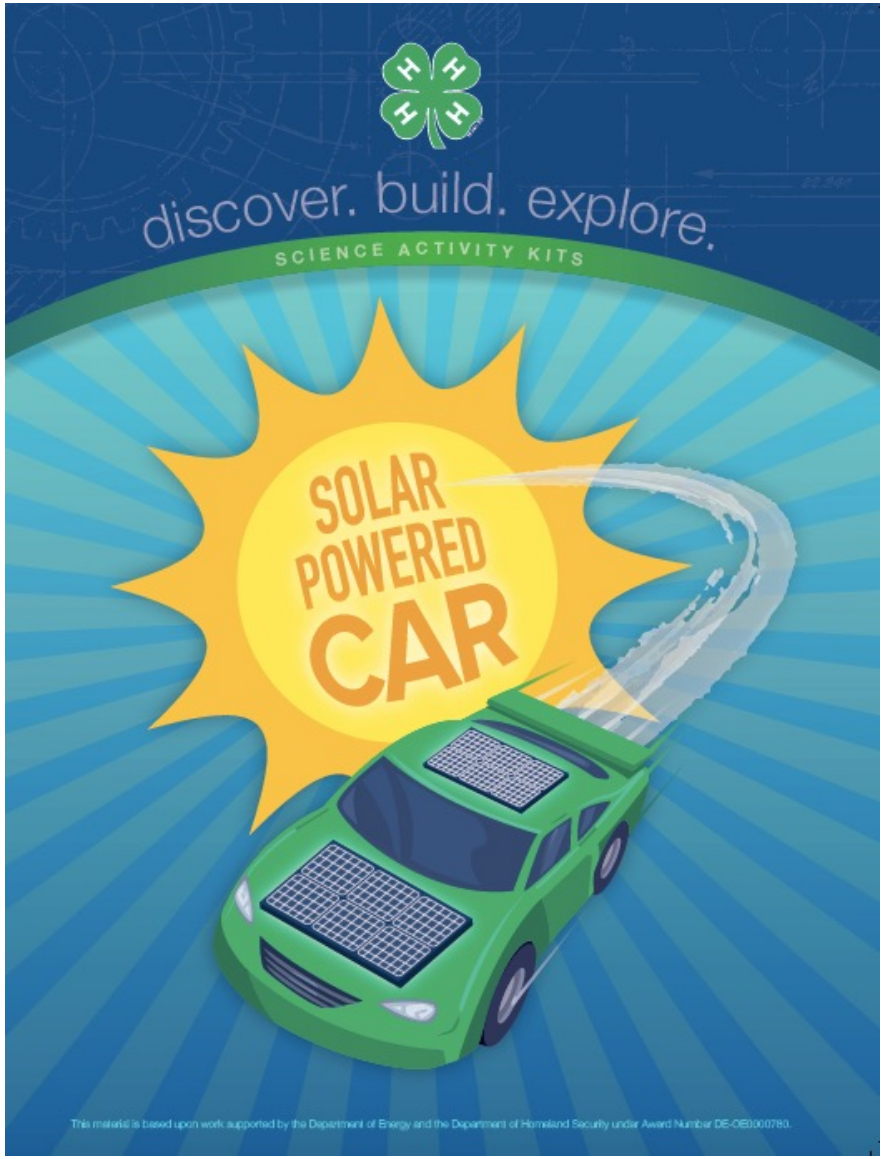
Beads or other spacers may help reduce friction or play between the wheel and the body.

Adding a Gear to the Motor

Push the motor adapter pin onto the motor spindle. (Gently tap with Then push the motor adapter pin into the center hole in a smaller gear.
When **light is shining on** the solar panel and it is attached to the motor, the gear spins.


discover. build. explore.
SCIENCE ACTIVITY KITS
SOLAR POWERED CAR





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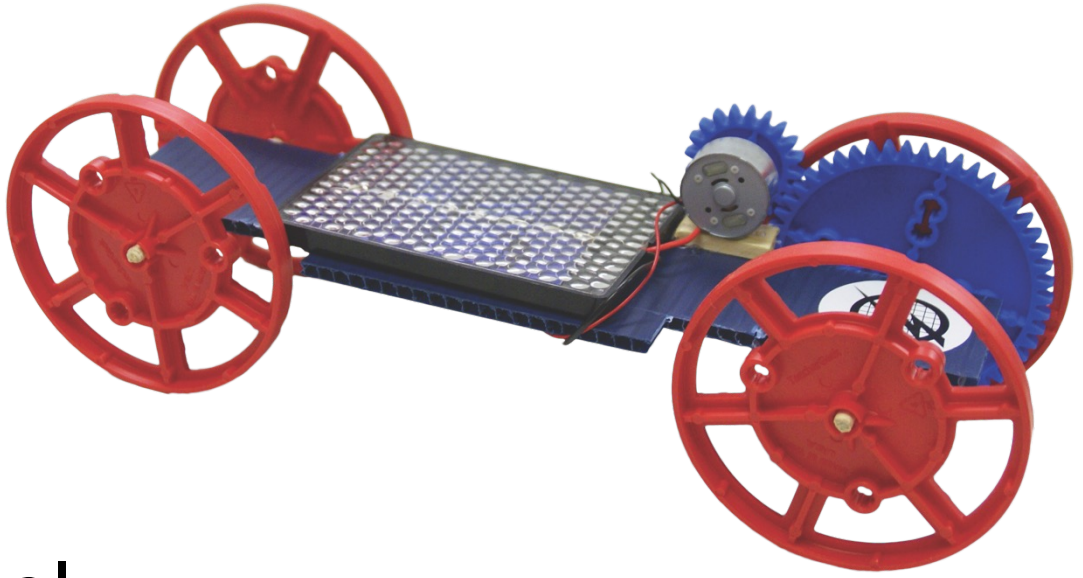
Redesign and Retest



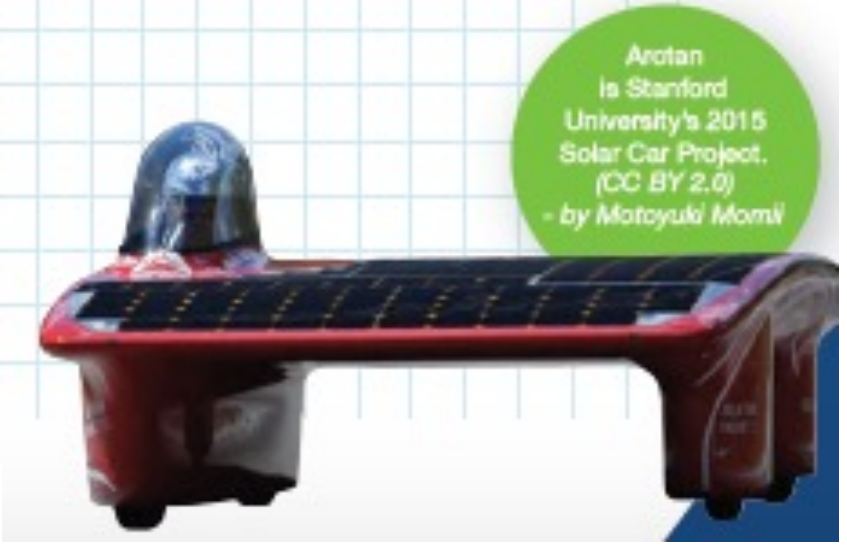
After your test run...

Try other positions for the solar panel.

- Think about what happens when the vehicle moves into shade or a shadow.
- Try different wheels or gears.
- Try changing the position of the wheels.
- Consider changes to the size or shape of the body.

Observations and conclusions...

- Describe the adjustments that improved your car.
- Make a sketch or take a photo of your best design and attach it here.



Argo is the University of Illinois's Illini Solar Car team's vehicle. It competed in the 2017 Bridgestone World Solar Challenge. Used with permission - Illini Solar Car

The solar panels on this car charge batteries that run this electric car. CC BY 2.0 - Daniel Bowman

Did you know?

The sun is the source of almost all of our energy. Wind results from changes in temperatures, driven by sunlight. Plants convert energy from sunlight through photosynthesis. For thousands of years people have burned forms of plant life for heating, cooking, and light. Coal and gasoline were once plant life. Heat from the sun can warm a room just by shining through a window. The sun's heat is also used to heat water and can be concentrated to produce steam for electricity generation.

Photovoltaic (PV) cells, or solar cells, produce electricity directly from light. PV powered calculators have been common for many years, and PV cells have become especially useful for providing electricity in places that are not near conventional sources. Solar panels composed of many solar cells have been used in space to power satellites since 1958.

Solar powered charging station for electric cars at Argonne National Laboratory. Used with permission - Argonne National Laboratory

Solar powered cars are electric cars. All of the cars in these photos use solar panels to charge batteries that run the cars' motors. The competition car battery sizes are constrained by the rules of the competitions, so these cars are lightweight and designed to have little wind resistance. The innovations developed by the competition teams will help improve electric cars for everyone.

Extend

Can you think of a way to add a rechargeable battery to your solar car?

Learn More

The Story of Solar Electricity:
californiasolarcenter.org/fste/fste.html

Energy 101: Solar PV video:
energy.gov/eere/education/videos/energy-101-solar-pv

Solar farm at the Indianapolis International Airport:
indsolarfarm.com

The Cyber Resilient Energy Delivery Consortium (CREDC) Education team continues the work of the TCIPG Education project. The team develops interactive lessons and activities designed to link researchers, educators, consumers, and students.

World Solar Challenge:
worldsolarchallenge.org

American Solar Car Challenge:
americansolarchallenge.org

American Solar Energy Society:
ases.org

Cyber Resilient Energy Delivery Consortium:
cred-c.org

Solar energy on the University of Illinois campus:
icap.sustainability.illinois.edu/project/solar-energy-campus

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Visit:
credc.mste.illinois.edu/kits-extras

WARNING!
Contains small pieces.

Back wheels

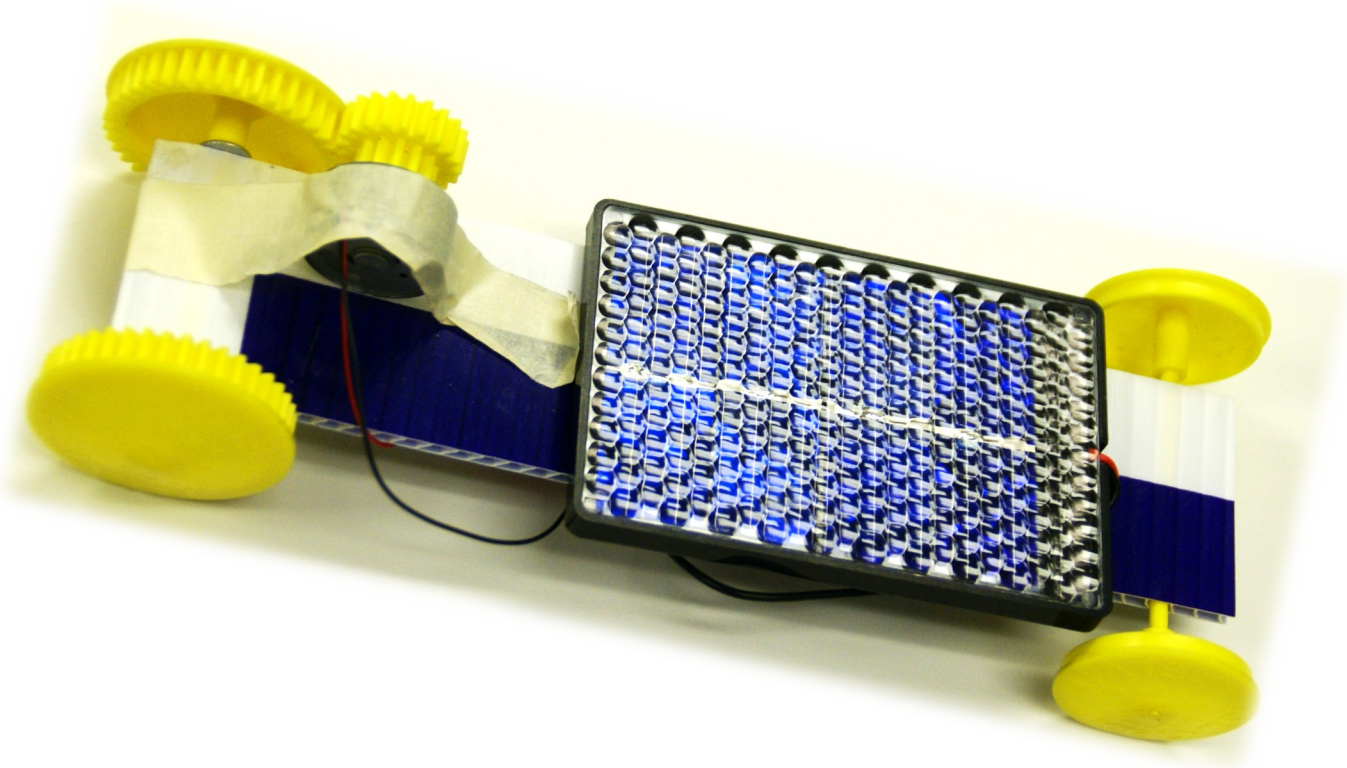
Front wheels

Axles

Gear for the motor shaft

Another Example Solar Powered Car

This example car uses smaller wheels. The back wheels also have gear teeth. There are yellow axles that fit the wheels in the kit. The axles are pushed through tunnels in the corrugated body. A small gear is attached to the motor spindle and positioned so the teeth turn the geared back wheel.



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