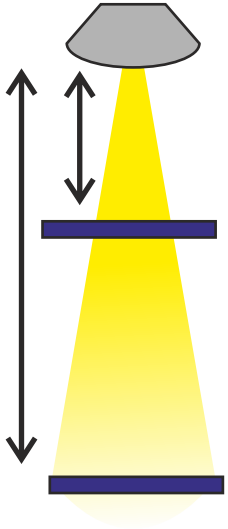
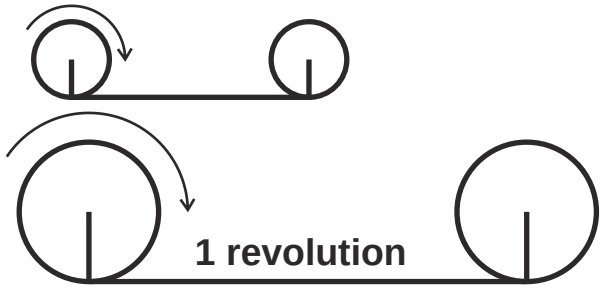
Solar Power



These cars use solar panels to convert light into electricity. The electricity is then converted into mechanical motion through the motor.
You can test this using the hand held torch. Hold the light far away from the solar panels and see how fast the motor spins (if at all).
Gradually move the torch closer to the solar panels and watch the motor. It should start to spin and then get quicker as the torch is moved even closer. This can also be tested outdoors, using your hands to shade the panels and then gradually letting through more light.
These cars use two solar panels. More area to catch the light means more power available. You can test this by covering on of the solar panels.

Wheels and speed

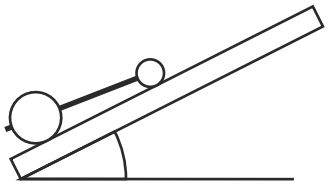
There are a two different sized back wheels - large and small. These will affect the speed of the car.
Larger wheels go further for each rotation, so a car with larger wheels should go faster.
This can be tested by rolling each wheel one revolution along the ground and marking how far they have gone.



This only matters for the motorised wheels - the other wheels do not affect the speed.

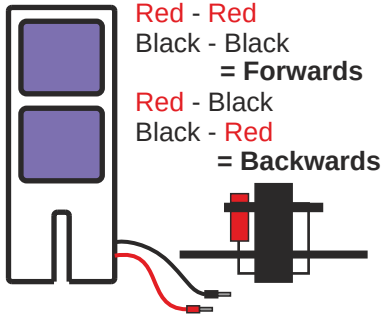
Tyres and friction

The back wheels have rubber ‘tyres’ which can be added. These will help to ensure that the wheel has a good grip to the surface.
A car with better grip will ensure the power is transferred to moving forwards. A car with tyres should go faster (this depends upon the surface).
You can test this by making the cars go up-hill. The wheels with better grip will be able to go up a higher gradient.
(*Side note:* the car with smaller back wheels will also be better at climbing hills as it goes slower and hence has more climbing ‘force’).



Direction

The direction of the motor depends upon how it is wired to the solar panels. Test this by swapping the red and black plugs around and seeing which direction the car travels.



Red - Red
Black - Black
= Forwards

Red - Black
Black - Red
= Backwards

Weight

The weight of the car affects how fast it will go.
It will affect the acceleration of the car, hence it will take longer to get up to the same speed.
This can be tested by adding weights to the top of the car (being careful not to block the solar panels) and then timing how long it takes to go a measured distance.
Try again with different weights.

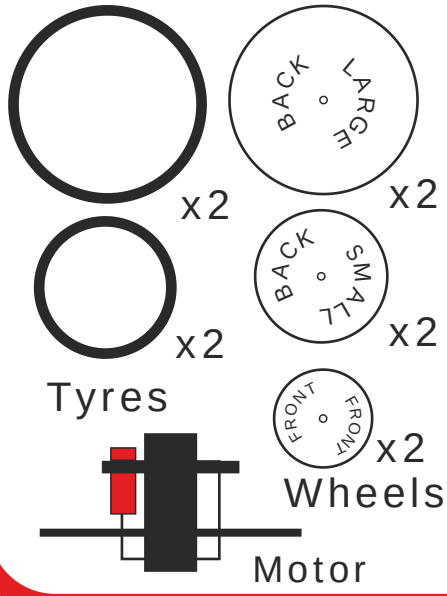
Aim

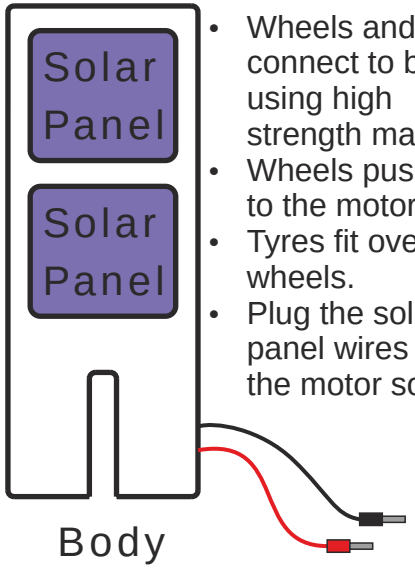
To enable pupils to understand energy conversion and the action of solar cells.

Objectives

Build a kit car.
Investigate different ways of assembly.
Make the car travel a specified distance as quickly as possible.

Kit Contents





- Wheels and motor connect to body using high strength magnets.
- Wheels push-on to the motor axle.
- Tyres fit over the wheels.
- Plug the solar panel wires into the motor sockets.

Problems?

Are the magnets aligned correctly?
Problems with friction:
- Are wires in the way?
- Are wheels sticking or rubbing?
- Are the back wheels held on correctly (friction fit)?

Is there enough light hitting the solar panel?
Are the wheels aligned correctly?
Is the race surface flat and level?

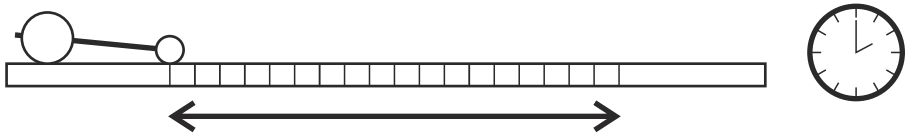
Solar Car kit developed by:
Renewable Energy Innovation
www.re-innovation.co.uk

Activity Ideas

- How do solar cells produce electricity?
- Where might children have seen solar cells before?
- How is energy transferred?
  (light energy – electrical energy - mechanical energy)
- How do we measure speed?
  (distance over time, link to maths)
- Which wheel size goes faster?
  (larger wheels go further per revolution)
- What gradient can the car climb?
  (This will be a measure of its power)
- What is the effect of adding tyres?
  (More grip, therefore better power transfer)
- Will the car go in reverse?
  (Turn motor round or swap terminals)
- What properties of magnets are used in making the kit?

Speed and distance

Speed is the **distance** travelled within a certain **time**.
If the car travels 1 metre in 1 second then the car is travelling at 1 metre per second.
You can test this by measuring the length of the racecourse.
You can then time the car using a stopwatch.
The speed of the car is the distance divided by the time taken to travel that distance.



Each car is raced along the racecourse. The times taken is measured.
You should take several measurements, if time allows.